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Proceedings of
NINTH PACIFIC TRADE AND
DEVELOPMENT CONFERENCE

MINERAL RESOURCES
IN THE
PACIFIC AREA

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TABLE OF CONTENTS

Dedication to Harry G. Johnson.	1
FOREWORD.	4
Opening Address, by John J. Balles, President, Federal Reserve Bank of San Francisco	6
Greetings by Edmund G. Brown, Jr., Governor State of California (delivered by Thomas Gay):	9
"California's Place in Mineral Resources Development Among the Pacific Basin Countries"	
 1. <u>Introduction</u>	18
Lawrence B. Krause	
*** <u>I. THE ECONOMICS AND POLITICS OF NATURAL RESOURCES</u> ***	
 2. <u>The Raw Material Product Cycle</u>	30
Stephen P. Magee and Norman I. Robins	
Discussants: Danny Leipziger	57
Narongchai Akrasanee.	62
General Discussion	65
 3. <u>Mineral Trade and Investment Patterns in the Pacific Area</u> . . .	69
N. M. Switucha	
Discussants: Sirman Widiatmo	122
Francis K. Chan	127
General Discussion	131
 4. <u>Resource Trade and the Development Process in Developing Countries</u>	135
Ross Garnaut	
Discussants: Kuo-shu Liang	166
Anthony D. Scott.	169
General Discussion	174

5.	<u>Ocean Mining in the Pacific Basin: Stimulus and Response</u>	177
	Michael Gorham	
	Discussants: Leslie V. Castle	234
	David V. Hudson, Jr.	237
	General Discussion	241
	*** II. NATIONAL CASE STUDIES IN NATURAL RESOURCE PROBLEMS ***	
6.	<u>Australia's Minerals Production and Trade: Case Study of a Resource-Rich Developed Country.</u>	245
	Ben Smith	
	Discussants: H. Edward English	305
	Hang-Sheng Cheng	309
	General Discussion	314
7.	<u>Options for a Resource-Poor Developed Country -- Japan.</u>	316
	Yasuhiro Murota	
	Discussants: Hugh Patrick	354
	Laurence L. C. Chau	359
	General Discussion	363
8.	<u>Issues in the Development of Resource-Rich LDCs: Copper in Chile.</u>	366
	Ernesto Tironi	
	Discussants: Romeo Bautista	414
	Danny Leipziger	418
	General Discussion	420
9.	<u>Natural Resource Problems in a Resource-Poor Developing Country: The Korean Case</u>	423
	Wontack Hong	
	Discussants: Francis K. Chan	446
	Yashichi Ohata	450
	General Discussion	453

III. POLITICAL ECONOMY OF MINERAL RESOURCES: POLICY ALTERNATIVES

10.	<u>Commodity Trade from a North-South Perspective</u>	457
	Jose Pinera	
	Discussants: Seiji Naya	498
	Norman I. Robins	500
	General Discussion	503
11.	<u>Japan's Resource Security and Foreign Investment in the Pacific: A Case Study of Bilateral Devices between Advanced Countries</u>	506
	Kiyoshi Kojima	
	Discussants: Michael Keran	522
	Kuo-shu Liang	529
	General Discussion	532
12.	<u>The Wider Context of Bilateral Resource Exploitation Arrangements between the LDCs and the DCs</u>	535
	Miguel Wionczek	
	Discussants: Romeo Bautista	560
	H. Edward English	564
	General Discussion	569
13.	<u>International Commodity Control: The Tin Experience</u>	571
	Mohamed K. M. Ariff	
	Discussants: Laurence L. C. Chau	598
	Kenji Takeuchi	602
	Sirman Widiatmo	606
	General Discussion	609
14.	<u>An Organization for Pacific Trade, Aid and Development: Regional Arrangements and the Resource Trade</u>	611
	Peter Drysdale	
	Discussants: Saburo Okita	649
	Seiji Naya	651
	Hugh Patrick	654
	General Discussion	660
	<u>STATISTICAL APPENDIX</u>	662
	N. M. Switucha	
	<u>LIST OF PARTICIPANTS</u>	704

HARRY G. JOHNSON*

1923-1977

It is my privilege to present to you a memoriam to Harry Gordon Johnson, our colleague and friend. In announcing the death, the Chairman of the Department of Economics of the University of Chicago, Arnold Harberger stated that "the name of Harry G. Johnson will long stand in the history of economic science." I fully agree and would add that he will be greatly missed, especially by this assemblage, because Harry was one of the founding fathers of the Pacific Trade and Development Conference. His intellectual support legitimized the endeavor for all of North America. He helped launch the experiment in Tokyo in January 1968 and attended all but one of the subsequent seven meetings. As you know, he was one of the four members of the American Steering Committee for this meeting, to which he contributed until his death.

Harry will be remembered for his teaching, for his writing and for his conference participation. As a teacher, Harry had a reputation for requiring the most exacting scientific content in his courses while insisting on its relevance to the real world. He was demanding upon his students, but with equal vigor he defended their legitimate rights with school administrators and fought against the formalities and other complications which Deans devise to bedevil student life. Harry's reward for helping so many students was a never-ending stream of communications which he somehow found time to answer. Competition for his teaching became so intense that he could clear the market only by accepting appointments two at a time -- to the profit of students and international airlines alike.

His writings cover the full spectrum of economics and he made major contributions to monetary and international trade theory. I

*Delivered at the Ninth Pacific Trade and Development Conference August 22-26, 1977 in San Francisco.

observed at first hand his research capabilities in the summer of 1965, when he wrote the entire manuscript subsequently published by the Brookings Institution as Economic Policies Toward Less Developed Countries (January 1967). I marveled at his ability to assimilate theory and empirical findings and draw policy implications therefrom; and at a speed unknown at Brookings before or since. My reward for diligently criticizing drafts of chapters cascading from his pen was to have my secretary stolen away by him and spirited off to England. Upon my chiding him for his ingratitude, Harry responded in characteristically matter-of-fact fashion that Suzy was the only secretary he ever had who could read and type his scribblings as fast as he could write.

But it was as a conference participant that many of us knew him best. Harry Johnson almost single-handedly made international conferences not only intellectually respectable, but the preferred approach to organizing, assembling and transmitting research findings. The conference form permits international participation and inter-disciplinary approaches, and gives immediate circulation to ideas for which time is frequently a critical dimension. Harry perfected the art of the instant summary at the close of a conference, which helps fix main ideas in the minds of those present. There was no corner of the world to which Harry would not travel for conferences, despite the demands they were making on his physical well being.

Let me add a more personal note. Because of common interests and alphabetical logic which frequently placed Johnson and Krause side-by-side, I came to expect and somewhat enjoy the sight of wood chips from Harry's whittling inundating my notes, trousers and shoes. I further remember a particular conference at a beautiful but isolated spot at the top of a mountain in Switzerland. While admirably suited to keep the attention of the participants firmly concentrated on the problems of the Bretton Woods monetary system, it lacked easy access to a grog shop required to circumvent the outrageous prices demanded by the Swiss innkeeper. For Harry found the cocktail hour before dinner an admirable time to educate and be educated by the commercial bankers who were attending. In his room, on a one-to-one basis, the fears of flexible exchange rates were exorcised, myths dispelled, and real problems appreciated. Such an educative process required lubrication. To my

surprise, I discovered that my wife, Sallye, had become chief engineer of a gin and vodka underground express between Lucerne and the Burgenstock via streetcar, lake steamer and funicular railway. Harry never tired of teaching, and he did not consider bankers -- even central bankers -- hopeless students; indeed they might even be taught the relationship between monetary aggregates, economic activity, balance of payments and inflation, if properly prepared for the lesson.

As you know, Harry's first stroke was very debilitating, but he did not let that stop him from attending all the meetings to which he was invited; and there were many. Yet it took its toll. His mind was still as critical and his tongue as sharp, particularly in the face of pomposity and self-deception, yet the criticisms became less relieved and seemingly less positive in their focus.

All of Harry's work was marked by intellectual brilliance, honesty and courage. Yet with all of that, Harry was very human with human failings. I recall the first time he was a guest in our house. Sallye had prepared dinner in usual abundance because, in her words, if an army should stop by, there should be something to eat, only to discover that two of our dinner guests had cancelled at the last minute. Once the dinner began, however, her concerns of excess supply turned to fears of unsatisfied demand for when it came to eating and drinking, Harry was an army.

And in May of this year, the excesses of his earlier life-style finally prevailed. At the age of 54, Harry succumbed to liver failure.

As I think of Harry, I do so without sadness but with the pleasure of knowing we have been touched by one of the giants of our age.

We may do our work secure in the knowledge that an international conference on this subject is the most fitting memorial to Harry Johnson: we are paying the most appropriate tribute to him. So let the conference begin.

Lawrence B. Krause

FOREWORD

The Ninth Pacific Trade and Development Conference, held at the Federal Reserve Bank of San Francisco on August 22-26, 1978, was directed to the theme of development and trade in mineral resources among the nations in the Pacific region. Some 40 policy-oriented academic and business economists, and government and central bank officials acting in their private capacities, participated in the conference. They came from a number of resource-rich and resource-poor Pacific Basin countries -- including North America, Latin America, Oceania, Southeast Asia, and Northeast Asia --and represented a wide range of expertise and viewpoints.

This conference is the ninth in a series begun in January 1968 to examine important issues of economic policy for the Pacific region. Previous conferences were held in Japan, the United States, Australia, Canada, Mexico, New Zealand, and Thailand. These conferences have been organized by an informal group of academic economists in order to enhance understanding of the economic importance of the Pacific region and to promote objective analysis and evaluation of relevant policy issues by government policy makers and business leaders as well as policy-oriented scholars. The Pacific Trade and Development Conference series is administered by an International Steering Committee chaired by Professor Kiyoshi Kojima (Hitotsubashi University, Japan), and its executive committee, consisting of Professor Kojima, Dr. Peter Drysdale (Australian National University, Australia) and Professor Hugh Patrick (Yale University, U.S.A.).

Each conference has been devoted to a specific theme of policy importance. The proceedings of each conference -- papers, comments of assigned discussants, and a summary of the general discussion -- have been published as follows:

1. Kiyoshi Kojima, ed. Pacific Trade and Development (Tokyo: Japan Economic Research Center, 1968).
2. Kojima, ed. Pacific Trade and Development II (Tokyo: Japan Economic Research Center, 1969).

3. Peter Drysdale, ed., Direct Foreign Investment in Asia and the Pacific (Canberra: Australian National University Press, 1972).
4. H.E. English and Keith A.J. Hay, eds., Obstacles to Trade in the Pacific Area (Ottawa: School of International Affairs, Carleton University, 1972).
5. Kiyoshi Kojima, ed., Structural Adjustments in Asian-Pacific Trade (Tokyo: Japan Economic Research Center, 1973), two volumes.
6. Kiyoshi Kojima and Miguel Wionczek, eds., Technology Transfer in Pacific Economic Development (Tokyo: Japan Economic Research Center, 1975).
7. Leslie V. Castle and Sir Frank Holmes, eds., Co-operation and Development in the Asia/Pacific Region -- Relations Between Large and Small Countries (Japan Economic Research Ctr., 1976).
8. Narongchai Akrasanee, Seiji Naya, and Vinyu Vichit-Vadakan, eds., Trade and Employment in Asia and the Pacific (Honolulu: University Press of Hawaii, 1977).

Because of the small and simple administrative arrangements of the conference series, organization of each conference is a substantial undertaking. We therefore appreciate the efforts of those who made possible the Ninth Conference and the publication of these Proceedings. Special thanks are due to the Federal Reserve Bank of San Francisco, which served as sponsor and host, in particular to Kent Sims, Michael Keran (our co-organizer of the Conference), Hang-Sheng Cheng, William Burke, and the indefatigable Elizabeth Prettyman. Essential financial support was provided by the Asia Foundation, the Ford Foundation, the Foundation for Research in Economics and Education, and the International Institute for Economic Research, and Standard Oil Company of California, Bank of America, Bechtel Corporation, Crown Zellerbach Company, Exxon, and Utah International. The rapporteurs, Michael Riordan and Larry Meissner, prepared the general discussion summaries and rendered other editorial assistance. To all who made this effort successful we give our thanks.

OPENING ADDRESS

John J. Balles, President

Federal Reserve Bank of San Francisco

(Ninth PAFTAD Conference, August 22, 1977)

Speaking as the President of the host institution, I am happy to welcome you to the Federal Reserve Bank of San Francisco. To quote Confucius, "Happy is he who has friends visiting from afar." We see gathered here distinguished scholars from 15 Pacific Basin countries, and we even have visitors from such exotic places as Berkeley across the San Francisco Bay and Stanford down the Peninsula. To all of you, I extend a warm welcome on behalf of our Bank.

In addition, I wish to compliment the organizers of the PAFTAD Conference series. I understand that Professor Kiyoshi Kojima of Japan was the guiding spirit behind the first of these conferences back in 1968. Other members of the original International Steering Committee included Sir John Crawford and Dr. Peter Drysdale of Australia, Professor Edward English of Canada, Dr. Saburo Okita of Japan, and Professors Harry Johnson and Hugh Patrick of the United States. I'm happy to see that several of them are with us today.

The success of this series of meetings is reflected in its durability through the years. This shows that the conferences have been addressing important issues, and that the peoples and the governments of Pacific Basin countries are interested in what you have to say on these issues. It takes a great deal of foresight, persistence, and plain hard work to set us these conferences and keep them going year after year. I congratulate the International Steering Committee for thier leadership, and the U.S. Committee -- Dr. Lawrence Krause, Professor Hugh Patrick, and Dr. Michael Keran -- for putting together this year's conference.

As in the past, it addresses a major economic issue -- natural resources in an age of apparent scarcity. One of the factors

underlying the rapid economic growth of the Pacific Basin during the last two decades has been its vast natural-resource base. This conference deals with a number of unresolved issues which have generated conflict between nations, and between private and public sectors in this area. By analyzing the issues, proposing solutions, and publishing the results of your deliberations, you will be able to help policymakers and the general public make better-informed judgments about natural-resource problems.

As many of you know, the area served by the Federal Reserve Bank of San Francisco covers the western third of the United States, extending from the Rocky Mountains in the east all the way to Alaska, Hawaii, and Samoa in the west. We are indeed very much a part of the Pacific Basin. We are highly conscious of the strong economic, financial, and cultural ties that bind us together for our mutual benefit. In 1974 and again in 1976, I visited many of your countries to meet with your finance ministers, central bank governors, bankers and businessmen. In return, I have received many Pacific Basin leaders here. In fact, I am expecting to see Mr. Michael Wong, the Managing Director of the Singapore Monetary Authority, later this week.

Within the Federal Reserve System, our Bank has the responsibility of developing a special expertise on the economic issues of the Pacific Basin region. In the last two years, we have established an International and Pacific Basin Section in the Research Department to carry out that responsibility. We have conducted studies on inflation and monetary policy, econometric modeling, and foreign borrowing in Pacific Basin countries. In addition, we have taken the leadership in promoting research cooperation among the central banks in the region. Two years ago, we hosted at this Bank the First Pacific Basin Central Bank Conference on Econometric Modeling. It generated so much interest among the participating central banks that a Second Conference was held last year in Korea, and a Third Conference will be held in New Zealand this November.

We have also established a Clearinghouse for Pacific Basin Central Bank Economic Research, in order to facilitate exchange of information on the research activities being conducted at these

various institutions. Lastly, we have begun publishing a quarterly statistical bulletin, Pacific Basin Economic Indicators, and in our Research Library we have set aside a special room for a Pacific Basin collection.

I say all this in order to emphasize our continuing efforts at this Bank to expand our knowledge of Pacific Basin countries. Indeed, as scholars in this area, we all share a common interest in promoting understanding of the economic issues that confront our region. I invite you to call on us whenever you come to the United States, and to send us any papers you write on Pacific Basin economic subjects. A steady interchange, I am sure, will work to the advantage of all of us. With that said, I wish you a successful conference and a pleasant stay in San Francisco.

CALIFORNIA'S PLACE IN MINERAL RESOURCES DEVELOPMENT
AMONG THE PACIFIC BASIN COUNTRIES

Thomas E. Gay, Jr.

State Geologist

I am sorry that Governor Brown cannot be here. His schedule had conflicts that couldn't be resolved.

He asked me to convey his strong conviction that mutual good will among the countries of the Pacific Basin is essential, in the important business of natural-resource raw materials development.

From the fact that this series of Conferences has been convened for the past 8 years, and the very impressive portfolio of participants here today it is clear that this meeting is a significant step in producing just the type of good will and mutual understanding that are fundamental to promoting development and trade of natural resources among the nations of the Pacific Basin.

As California's State Geologist, I represent a little different slant from most of you here. The main thrust of my concern, and my agency's function as California's geological survey, is in the technical and environmental aspects of finding and extracting one of the key types of natural resource raw materials: mineral resources. (And in the term "mineral resources" I include both metallic and nonmetallic -- so called "industrial minerals" -- and the energy hydrocarbons petroleum, gas, and coal.)

In the United States' economic-social system, State government technical agencies like mine have the function of producing regional or statewide maps and reports. These give the basic background data useful to private industry firms that conduct actual exploration, development, extraction, and processing of mineral materials. For example, we produce the Geologic Map of California, the Gravity Map of

California, and bulletin reports on such commodity studies as Salt in California, Manganese in California, or Tungsten in California, etc. These maps and reports are produced largely by compilation of field data released to us by private industry firms -- the work of petroleum and mining company exploration geologists -- as well as Federal (U.S. Geological Survey, and U.S. Bureau of Mines) and University research geologists. Also, there's considerable original contribution from field investigation by our own staff geologists, geochemists, and geophysicists. These regional and statewide reports give the setting of a mineral province, and bring out broad structural trends, or unique regional patterns of mineralization, or subtle relationships between widely separated mineralized areas. Using them, individual companies can recognize possible targets for localized, intensive exploration to locate and define individual ore bodies, petroleum sands, etc., that they then test out, mine, and put into the stream of economic commerce -- including international markets.

That is one way a government can foster international trade in nature resources -- by helping domestic resource-exploration firms. And I hasten to add that the Federal government agencies I mentioned -- U.S. Geological Survey, and U.S. Bureau of Mines, among others -- perform similar industry-assistance regional projects, as do the comparable agencies in many of our 50 states.)

Another way that the California State geological survey contributes, is to have those same maps and reports available to the increasing number of foreign investment firms who are seeking opportunities in California -- some in minerals and petroleum extraction possibilities -- but more seeking a wide range of possible industrial investments. Our basic geologic information on potential landslide, fault, and earthquake hazard conditions (hazards which do exist in some parts of California) can be useful in decisions to invest or develop, or not to, in certain localities -- and to prepare necessary reports considering environmental impacts of proposed developments.

Recognizing from the Conference agenda the wide range of resource development conditions in the various nations of the Pacific Basin, I would like to try to identify California's place, as relates to

"resource-rich" or "-poor", and "developed/underdeveloped economy." I think a brief description might illustrate some of the consequences of "development."

As a State -- a unique political subunit, and reasonably unique geographical region within the United States -- California is both resource-rich and well-developed. Discovery in the mid-1840's of placer gold in the Sierra Nevada foothills about 100 miles east of San Francisco, was the main impetus to early colonization of the State. Agriculture proved profitable, especially as water resources were developed, and then petroleum was discovered in the early 1900's and became the essential source of cheap energy during the first half of this century while industrialization and development were proceeding in a westward-rushing tide in America. Recent years, on the other hand, have brought to California evidence of a slowing or perhaps turning of that tide. The population explosion continues, and proliferation of cultural amenities, but -- at least in the realm of the mineral resources kingdom -- we are clearly seeing disquieting evidence that the growth of raw-material extraction could not forever indefinitely keep pace with the population growth rate.

Nearly all the rich early discovered mines in California were long since worked out, and the combination of lower grade ore, and inflated mining costs had severely hit metal mining in the State. Further, the urbanization process of "population explosion" threatened to spread homes and commercial developments over the major unworked deposits of aggregates, preventing their extraction, and losing them as surely as if they had been worked out.

A second turning point was the emergence over the past decade, at an organized, politically focussed level, of serious concern for air, water, and land-surface environmental health of our State.

In the historical cycle of emergence and development of an "underdeveloped" nation into a "developed" one, California represents that stage of maturity where the future availability of sufficient supplies of raw resources requires another kind of industrial and political process than "Dig it out fast and cheap -- then move to the next highgrade deposit."

"Digging it out fast and cheap" has always been the hallmark of success in minerals production in the United States, and in California. It was our good fortune that a wide variety of mineral materials could be found here in excellent quantity and quality, including petroleum -- the key to the energy resources required to mine, process, refine, and manufacture consumer products from any and all of the other mineral materials present. Abundance is seductive, however, in disguising the fact that mineral raw materials, as a non-renewable resource, do indeed have a finite supply. And that finite-ness shows up gradually for certain materials before others, including gradual dropping in grade of ore, that tends to be compensated for in improved processing, and price rises. The gradually increasing cost of supplying certain low-cost, near-source commodities (such as sand and gravel for concrete aggregate) to certain localities also tends to be subtle, so that general public awareness of the nonrenewable nature of the raw material consumed is slow to crystallize in form to be grasped and made part of a nation's public policy, or of its total economic way of life.

One other great truth of the impetuous process of development of a country, or a State, into a "developed nation," namely a finite limit to the elasticity of the environment, is also catching up with California, and presenting a "due" bill we are struggling with. The threat to California's environment arrived more through impacts of more and more people, and more and more energy-intensive (and consequence-blind) activities, than through minerals-related activities. But air quality, water quality, and degradation of the land surface itself, as to visual quality and as to necessary agricultural capacity -- all have become serious public concerns in California over the past decade.

One backlash of this public concern -- the imposition of restrictions on "polluting" industry -- has developed into a very serious threat to some segments of our minerals industry, in effect threatening to make inaccessible major portions of known reserves of many vital minerals. A series of tough laws, at both national and state levels, were enacted in the past decade, to protect water, air, and landsurface quality. These new laws have had powerful effects on the exploration for, and the mining of, mineral raw materials. Also there have been

crippling effects on the industrial processes required to refine and manufacture the mineral raw materials into saleable consumer products. Oil refineries, iron and steel mills, and cement companies -- both old and new -- have been faced with mounting pressures to incorporate expensive "cleanup" systems in order to operate within California's econcern for its environment.

My purpose in dwelling on the impact of environmental concern on mineral natural resources (and these or similar types of environmental impacts face other natural resource areas as well), is not to suggest the impact is fatal to raw materials industries. On the contrary, human ingenuity once convinced that the problem is important and unavoidable, is providing satisfactory answers to the environmental problems I've mentioned. But the costs of doing so are significant. And those costs have to be accepted as part of the unavoidable costs of doing business, by the mineral resources (and other natural resources) industries. They must raise prices; and the consuming sector must get used to paying them.

I am offering this experience of California's to the Conference as a reminder that, although there is a period of grace when an emerging nation may industrialize without unacceptable damage to its environment, it may well face serious questions at a more advanced stage of its industrial development. In California, in hindsight, the lesson is clear: we should have started much earlier to internalize the environmental costs of natural resources development; although identified industry costs -- and product prices -- would have been increased earlier, the competitive inequities and other industrial and political problems would have been worked on seriously, and be much closer to solution today than we presently find them. Our environmental problems are compounded in the present era, when social problems, inflationary pressures, and energy problems are leaving but little political patience for the very real problems of natural resource development.

And besides the example of belated necessity, I can offer the comfort that current experience here is producing technological equipment and systems that can be installed from the first in developing natural resources industries in new localities, so they can avoid some

of the environmental impact from the outset.

A special area deserving consideration at any Conference on natural resources in the Pacific Basin is that of potential recovery of minerals from the sea floor. I see that the Conference will discuss this later today or tomorrow. The potential for near-shore recovery of sand and gravel, phosphorite, and heavy minerals from placers -- not to mention sea-water minerals like salt and magnesia -- is left to those nations that own the segments of the continental shelf where these shallow-water deposits occur. They face the relatively purely economic problems of preparing near- and on-shore facilities, extracting the minerals, and marketing them. But the major new frontier of deep seafloor recovery of manganese-nickel-copper-cobalt nodules will surely require international negotiations and agreements, with both legal and economic problems to be solved. At the present time, technology to locate and evaluate these deposits -- let alone to recover and process them into saleable products -- is still in a developmental stage, and moving slowly because of the tremendous costs inherent in anything man tries to do in the deep ocean environment.

The generally dispersed habit of the ore nodules, like small potatoes scattered on the deep ocean floor, still poses a question whether minable concentrations can be found in the tremendous total tonnages needed to warrant the major investment necessary to start mining. But technical research and sampling is proceeding, including the exciting reports of unusual mineral concentrations in localities of seafloor hot-water springs near the Galapagos Islands. Meantime, the Law-of-the-Sea conferences, and efforts to assemble required deep sea venture capital, must proceed so that when the technological questions are answered, the legal, political, and economic framework will be ready, too, to permit deep sea mining in real earnest.

Governor Brown emphasized "good will among the Pacific Basin nations" in his greeting that I bring to this Conference. Let me say a few words in support of the importance of "good will relationships" in the area of mineral raw materials. Since mineral resources can be extracted only where they happen to occur, and since they happen to occur quite capriciously with respect to political boundaries, it

turns out inevitably that some nations have certain minerals and are potential exporters, but that most nations lack certain minerals, and must depend upon imports. Indeed, the raw materials trade thereby necessitated is a basic topic of this Conference.

That is the kind of good will we mean: nations recognizing their mutual interdependence for fundamental raw mineral materials, and setting out to conduct trade on as mutually favorable basis as can be found.

It is a brave goal of some nations to become self-sufficient in all materials. The United States has expressed such a national goal for energy supplies. I won't say that such a goal is impossible. But it is obviously many years in the future. And if a goal of self-sufficiency is to be extended to all essential mineral materials, it will be reached only through unexpected mineral discoveries; through unexpected technological breakthroughs (to recover usable mineral from low-grade ores, at an affordable cost in energy and dollars); through increase in recovery costs; or through reduction in tonnages consumed (perhaps by modified consumption practices, substitution, reutilization of scrap, etc.).

In the near term -- the next decade or so -- the trend is clearly not to count on miraculous self-sufficiency, but to work toward continued (and increased) reliance on international trade in mineral raw materials. Only thus can we maintain and improve standards of industrial development, as desired by virtually all the world's nations -- particularly those represented in this Conference. So good will -- and I would hope that "good will" could be considered practically synonymous with "good trade" -- is an essential climate for this Conference, and among the Pacific Basin nations here represented.

As a brief example of mutual interdependence, I would cite the United States' position in domestic vs. imported mineral raw materials, as reported annually by the U.S. Bureau of Mines and U.S. Geological Survey. These figures include metals, nonmetallic minerals, and mineral fuels.

In 1975 the United States imported \$21 billion of mineral raw materials, while producing \$62 million domestically (we imported about

one fourth of our total needs). In 1976 the U.S. imported about \$31 billion worth, while producing \$68 billion (imports had increased nearly 50 percent, up from 25 percent to 31 percent of the total U.S. consumption). A major part of this was in petroleum, of course, for which both the tonnage and the ratio of import to U.S. domestic production have been going steadily up.

In the hard minerals, the significance of the import figures lies less in the ratios than in the strategic and fundamental importance of many of the particular metals imported -- metals which the U.S. must have for its industrialized economy: for example, about 96 percent of our aluminum is imported; 18 percent of our copper; 86 percent of our rutile (to make metallic titanium); 52 percent of our zinc; 61 percent of our gold; 26 percent of our lead; 99 percent of our platinum; 100 percent of our tin; 44 percent of our silver; 28 percent of our iron ore; 74 percent of our nickel; 95 percent of our manganese; 44 percent of our tungsten; 98 percent of our cobalt; 100 percent of our chromium; and 32 percent of our vanadium.

To rely on these kinds of percentages of imports for the principal metals needed for survival of its heavily industrial economy, a nation had better foster good will among its suppliers! And just as surely, it had better develop and maintain trade relationships that emphasize the high reciprocal values that it gives in exchange to the supplying nations: there is no question the U.S. has such values to exchange, as you at this Conference will be discussing. This example of mutual interdependence happens to be drawn on the United States because I have those figures -- but I'm sure it applies to most of the countries represented here.

To close, I have given you a few impressions that strike me, as director of a technical bureau of State government. My level of concern is the technological and environmental problems of locating and extracting and trading the mineral raw materials needed for the continued development and economic health of the State of California as one of the United States -- and the nations of the Pacific Basin area here represented. The necessity for international good will, which

Governor Brown sends as his message to this Conference, is nowhere more apparent than in this area of mutual interdependence in natural resource development.

INTRODUCTION

Lawrence B. Krause

The discovery, development, processing, and trade in mineral resources is a matter of vital importance for the countries of the Pacific region, as elsewhere in the world. Many among the nations of the Pacific are inextricably intertwined through direct mineral development and trade relationships. Some developing countries in the region rely heavily on minerals exports, a few substantially on minerals imports. Among the developed countries, Australia and Canada are major minerals exporters, Japan (probably the economy in the world most dependent on imported raw materials) a major importer, and the United States exporter of some minerals and importer of others. Trade is conducted primarily through private markets, and multinational resource firms are a major factor in mineral mining projects throughout the region. Host governments in all countries perceive minerals development and trade to be of major policy significance.

The purpose of the Ninth Pacific Trade and Development Conference was to explore and analyze objectively a wide range of issues involving the political economy of mineral resources in the Pacific area. At the conference 13 papers were presented and discussed, organized around the following three broad topics: the economics and politics of natural resources, national case studies in natural resource problems, and the political economy of mineral resources (policy alternatives). Each of the papers is included in this volume with remarks prepared by the discussants and a summary of the general discussion. A Statistical Appendix by Nicholas M. Switucha of relevance to all the papers is included at the end of the volume. This introduction briefly describes the main features of the papers and discussion, and draws together some of the broad conclusions which emerged during the conference.¹

The Economics and Politics of Natural Resources

This topic included four papers, ranging from quite theoretical to purely empirical.

"The Raw Material Product Cycle" by Stephen P. Magee and Norman L. Robins (Chapter 2), presents an interesting extension of the dynamic theory of international trade. Their theory envisions a raw material cycle similar in spirit to Raymond Vernon's product cycle for manufacturers. In their theory, increasing demand for a natural resource causes a rising relative price. The rising cost first triggers conservation in use and expansion of supply sources, and then leads to development of lower cost synthetic substitutes for the natural resource. This kind of model with endogenous technical change implies that concern over eventual exhaustion of raw materials is misplaced. Discussion focused on a number of considerations not included in the theory, such as short-run price instability and factor requirements and availabilities. Such shortcomings are common to any new theory, and the paper has opened up many new avenues for future economic research.

"Mineral Trade and Investment Patterns in the Pacific Area" by N.M. Switucha (Chapter 3), summarizes useful information concerning mineral industries in many countries and deals with the characteristics common to recent mineral development. A major point emerging from the paper is the increasing involvement or interference of national governments in mineral development -- both as producers and consumers. Discussion indicated a general agreement that governments ought to be involved in mineral development, but that establishment of legitimate roles does not by any means imply that actual government involvement fulfills those roles. Complex technical and economic factors involved in mineral processing also invalidate the naive view held by some governments that producing countries gain by increasing mineral value added before export.

"Resource Trade and the Development Process in Developing Countries" by Ross Garnaut (Chapter 4), investigates the general process of natural resource-based economic development, of particular relevance to less developed Southeast Asian countries with sizable natural

resource endowments. He concentrates mostly on the important indirect linkages between mineral development and the rest of the economy provided by larger incomes and economic rent. Much of the paper discusses the issue of economic rent: how it can be identified, measured, increased, taxed, and used in a growth promoting fashion. The discussion emphasized some problems inherent in this type of economic development, including excessive export orientation in the economy to the detriment of manufacturing, difficulties stemming from the ultimate exhaustion of resource endowments, and instability in mineral markets.

"Ocean Mining in the Pacific Basin: Stimulus and Response" by Michael Gorham (Chapter 5), discusses the technical, economic, and political factors involved in the development of seabed mining. Some of the principal technical features include the composition of nodules, the high ratio of fixed-to-variable costs, and the reproducible nature of nodules. Economic problems such as closure of uncompetitive land-based mines could be anticipated and adjustment costs minimized. Political questions are of great importance now, as seabed mining is holding up agreement at the Law-of-the-Sea Conference, but Gorham suggests that a sharing arrangement for economic rents could bring sufficient support for an international regime. Some of the discussion indicated that this paper may be overly sanguine about the prospects for seabed mining given the many uncertainties and adjustment problems. Discussants disagreed on whether taxation should be used to distribute the economic rent from mining to all consumers and whether taxation would discourage investment and development of seabed mining.

National Case Studies in Natural Resource Problems

The four papers in this section of the conference covered four very different countries from the standpoint of mineral resource endowment and economic development: Australia, Japan, Chile, and Korea.

"Australia's Minerals Production and Trade: Case Study of a Resource-Rich Developed Country" by Ben Smith (Chapter 6), highlights the many problems that arose from the rapid development of Australia's

mineral resources beginning about 1960. Some of these problems included effects on income distribution, degree and form of foreign involvement, participation in producer cartels, barriers to trade in processed minerals, environmental and resource conservation questions, and issues of State and Commonwealth relationships. Much of the discussion concerning this paper revolved around the question of solutions for the problem of rapid mineral export growth leading to a chronic balance of payments surplus. Some solutions, such as currency revaluation or monetary expansion, tend to hurt manufacturing and are thereby unacceptable, but encouragement of capital outflow or further liberalization are more beneficial. Others criticized the relevance of economics to questions that involve large discontinuities rather than marginal change.

"Option for a Resource-Poor Developed Country -- Japan" by Yasuhiro Murota (Chapter 7), takes a broad view of Japan's resource acquisition alternatives. He defines three polar options, which are: buying natural resources on the (relatively free) world market, exercising political and military power to obtain resources, or adopting a no-growth or negative growth strategy to limit foreign resource needs, combined with a reassertion of traditional Japanese culture. Japan chose the second option during the 1930's with disastrous results, and the first option with great success during the postwar period. This choice has now created problems of dependence on external sources and excessive emphasis on economic growth to the detriment of culture and quality of life, leading Murota to advocate consideration of option three. All discussants were less than eager to see option three implemented, arguing that it would hurt LDCs exporting to Japan, create social strife in Japan, and destroy the ambitions of the lower middle class.

"Issues in the Development of Resource-Rich LDCs: Copper in Chile" by Ernesto Tironi (Chapter 8), deals with Chile's attempts to use natural resources to promote economic growth. The main problem of resource-based development is the tendency to create an unstable and structurally unbalanced economy. Short-run instability of natural resource prices in world markets has serious destabilizing effects for

a country such as Chile where a high proportion of export receipts (which finance needed capital good imports) come from natural resources. Tironi discussed various ways in which a government can counteract this type of instability. The discussants also were worried about instability problems, but were not convinced that Tironi's variable tariff proposal would increase stability. Discussion also stressed that the linkages between mineral development and general economic growth need to be more fully considered. While the tone of much of the discussion on natural resource-led growth was pessimistic, discussants believed Chile's future may be more optimistic as additional resources other than copper are developed.

"Natural Resource Problems in a Resource-Poor Developing Country: The Korean Case" by Wontack Hong (Chapter 9), takes an optimistic view. Korea, like Japan, has had an export-oriented high growth rate. No problems were encountered in obtaining rapidly expanding mineral resource needs on world markets, and even the oil crisis was overcome by rapid expansion of exports. Hong foresees no future problems so long as Korea has access to markets on a non-discriminatory basis and protectionism or resource nationalism does not become serious. The discussants felt this view was overly optimistic: difficulties could arise as external resource dependence rises and Korea's relative size in natural resource markets increases. Since Korea seems to show similarities to Japan's earlier experience, discussants felt Korea should avoid some of Japan's mistakes or could learn from Japanese problems of export-oriented growth and protection of mineral processing industries.

Political Economy of Mineral Resources: Policy Alternatives

The final of the three divisions of the conference included five papers. These dealt with various aspects of international trade in mineral resources and what kinds of institutional arrangements failed, or have been successful and ought to be implemented to improve resource market functionings.

"Commodity Trade from a North-South Perspective" by Jose Pinera (Chapter 10), examines four different trading regimes: free markets,

price raising, cartels, and commodity agreements. Lack of competition and unfair distribution of gains undermine free markets. Price raising works only if pushed to the competitive equilibrium level. Cartels involve efficiency costs and may redistribute income from poor to rich. Commodity agreements, however, are a reasonable solution if price stabilization goals are separated from income redistribution goals. Pinera argues that direct aid transfers are the best method of international income redistribution. Much of the discussion focused on whether natural resource price instability was a serious problem for LDCs, the impact of the instability on long-term prices, and its distortionary impact on mineral development investment. The discussants agreed that commodity stabilization agreements might be an efficient way to accommodate the politicization of commodity markets - an element which economists frequently ignore.

"Japan's Resource Security and Foreign Investment in the Pacific: A Case Study of Bilateral Devices Between Advanced Countries" by Kiyoshi Kojima (Chapter 11), focuses on different forms of developing natural resources and arrangements for resource production and sale (also discussed by Smith in Chapter 6). Kojima strongly favors long-term contracts as a basis for mineral development. While these agreements generally include more or less fixed quantities and prices for a number of years, they actually are a flexible arrangement, only guaranteeing the buyer and seller to continue to do business on mutually satisfactory terms. This type of assurance of markets reduces risk for companies involved in mineral development, fostering investment in natural resources on a scale to capture efficiency gains due to large scale development. They also permitted Japanese access without the necessity of equity participation, and stabilized prices for Japan as the dominant purchaser. Discussants were somewhat less convinced about the fairness of long-term contracts, noting the importance of bilateral bargaining strength in capturing gains. Others defended the multinational corporation approach to mineral development.

"The Wider Context of Bilateral Resource Exploitation Arrangements Between the LDCs and the DCs," by Miguel Wionczek (Chapter 12), adopts a favorable view towards natural resource availability and

trade between these two groups of countries. Even the multinational corporation dominance of technology is declining as technology is becoming more standardized and widely available. He sees no basic conflicts emerging, but stresses that because income instability in LDCs stemming from mineral price fluctuations can cause political instability, establishment of stabilization agreements is most important. The discussion of the paper did not bring any serious objection to Wionczek's basic optimism, though some questioned his view of LDC-multinational corporation relations and suggested that LDCs may be better off leaving exploration and exploitation investment to the multinationals.

"International Commodity Control: The Tin Experience" by Mohamed Ariff (Chapter 13), evaluates the eight international tin agreements which have operated since the 1930s. Although the agreements all included both floor and ceiling prices, they were ineffective in maintaining the ceilings, but more successful in defending floors. This bias favored producers, understandable since important consumer nations refused to cooperate until recently. The agreements also failed to reduce significantly price fluctuations, or stabilize export earnings, and may have biased investment in a way to increase short-run price instability and encourage substitutes to tin. The discussants were less negative in their assessment of the tin agreements. They argued that devices to defend a ceiling price are difficult (without the use of the U.S. stockpile), that a long-run equilibrium price is difficult to define in any case, and that higher prices may have benefitted the LDCs.

"An Organization for Pacific Trade, Aid and Development: Regional Arrangements for the Resource Trade" by Peter Drysdale (Chapter 14), traces the development of the OPTAD concept. Arising out of interest in the spectacular growth of trade among the Pacific countries, OPTAD is conceived of as a loose, unbureaucratized organization, including both developed and developing countries, which could do much to reduce the uncertainties involved in resource security. Drysdale also proposes a regional Pacific Resource Bank to provide funds for resource development, helping to overcome the present segmentation of capital markets providing concessionary loans. Discussion

indicated general support for the OPTAD concept, but some discussants saw potential problems in implementation due to the conflict between global and regional concerns in such major countries as Japan and the United States. Questions also remain as to how much power the organization should be given; enough power to generate regional interest might also frighten away members because of possible undesired obligations. Drysdale's paper is an important contribution to finding a pragmatic middle ground.

Policy Conclusions

During the course of the conference a degree of agreement clearly emerged among the participants concerning a number of policy issues. The conclusions reached here on these issues are particularly relevant to policy makers in the Pacific Basin countries.

The participants almost unanimously supported the view that the world does not face a shortage of raw materials. Expanding development of natural resources and technologically inspired synthetics should provide adequately for the world's needs. Nevertheless, many countries are deeply concerned about security of energy supplies. Any threats to existing energy supplies or barriers to new energy sources, such as nuclear energy, are likely to cause stronger than expected pessimistic reactions in the economies of energy dependent countries. Officials involved in designing energy policy must keep this reality in mind.

Resource producing and exporting countries also are seriously and increasingly affected by the instability of natural resource markets. Price and volume fluctuations in countries where resource exports are a significant part of trade, cause serious economic and political problems. Countries attempt to deal with these problems through domestic policies, but either they fail, or they succeed only by exporting the instability to others.

The best way to solve the problems of resource market instability is through international stabilization commodity agreements. Support of these agreements by the participants was not based on any belief that they are easy to negotiate or operate. Quite to the contrary,

such agreements are very difficult to design properly, as indicated by the history of the tin agreements. Rather, support was motivated by the importance of achieving greater stability in natural resource markets, and by the knowledge that all countries would benefit from a successful agreement.

A related point is that international commodity agreements should not attempt to redistribute income from developed to developing countries. Income redistribution is a legitimate goal, but it cannot be achieved by raising commodity prices. Direct aid transfer payments remain the best method of redistribution.

Countries dependent on imports of natural resources have a legitimate interest in obtaining stable and reasonable prices as well as assured access to supply. Natural resource producers also need assurance of markets and reasonable prices in order to undertake large-scale development of mineral deposits. The development contract combined with a long-term sales contract has proven to be a useful device to reduce risks for both large natural resource exporters such as Australia and large buyers such as Japan. However, the interests of small importing developing countries must also be recognized so that they can obtain access on a non-discriminatory basis. Policies of the advanced countries of the Pacific region should provide this assurance.

All countries were cautioned against relying excessively on export-led growth, regardless of whether it is based on natural resources or manufactured products. Domestic economic structures can become distorted and cause instability if proper development of domestic markets is overlooked, resulting in large fluctuations in investment and income. This instability can cause domestic political problems, and problems for trading partners as well.

Many countries have turned towards protectionism to forestall needed, albeit painful, structural economic adjustments. Countries need to be reminded that adjustments are especially beneficial to a country when growth rates are low. Special adjustment assistance policies may be required, but all countries should understand that the best aid to adjustment is adequate aggregate demand.

Participants urged countries to take a more relaxed view towards demands for a New International Economic Order. Views of developing countries in different regions vary considerably, and truly radical ideas that would destroy efficient markets are unlikely to gain widespread support. Furthermore, the relationship between developed and developing countries has been changing over the last twenty years, and with reasonable effort further changes can be accommodated without serious disruption. In general, no one foresaw any sources of serious conflict or problems of access to natural resources emerging in the near future for the Pacific Area countries.

Governments of both producing and consuming countries have increasingly participated or interfered in a variety of ways in the development and trade of natural resources. Intervention is justified because of the failure of free markets to operate efficiently on their own. But no country should assume that this justification constitutes approval of its specific government policies, as clearly indicated by the problems and failures of many past government policies analyzed at the conference. Domestic and inter-governmental policies and agreements must be designed with great care to bring true improvement over non-intervention results -- a point extremely important to the development of OPTAD plans.

Finally, policy makers in Pacific Basin countries should not be blind to economic developments in the region. Many so-called "high politics" issues must be addressed by governments, but attention only to those issues will be a serious mistake. The economic reality is that the Pacific Basin is the fastest growing area of the world and the economic interests of the region's countries are growing closer together. Economic policy on a regional basis deserves close attention, and if properly handled can provide substantial and mutual benefits for all countries.

These various points and policy recommendations were supported by conference participants who came from widely differing developed and developing countries in the Pacific Basin. That people of such economically and socially varied countries found agreement on these points lends considerable force to the validity of the conclusions, and

they should be given serious consideration by policy makers in all Pacific Basin countries.

***I. THE ECONOMICS AND POLITICS OF NATURAL RESOURCES ***

The Raw Material Product Cycle

Stephen P. Magee and Norman I. Robins

Discussants: Danny Leipziger
Narongchai Akrasanee

General Discussion

Mineral Trade and Investment Patterns in the Pacific Area

N. M. Switucha

Discussants: Sirman Widiatmo
Francis K. Chan

General Discussion

Resource Trade and the Development Process in Developing Countries

Ross Garnaut

Discussants: Kuo-shu Liang
Anthony D. Scott

General Discussion

Ocean Mining in the Pacific Basin: Stimulus and Response

Michael Gorham

Discussants: Leslie V. Castle
David V. Hudson, Jr.

General Discussion

THE RAW MATERIAL PRODUCT CYCLE

Stephen P. Magee and Norman I. Robins¹

This paper is an historical examination of the markets for three raw materials, two of which are important in the Pacific trade. The histories of these markets exhibit some interesting regularities which permit us to describe a raw material product cycle which parallels Vernon's cycle for manufactured goods. The raw material product cycle consists of three stages:

- I. Derived Demand Boom
- II. Substitution in Demand and in Supply Sources
- III. Synthetic and/or R & D Incursion

In this paper we will refer to these stages as the "boom stage," the "substitution stage," and the "R&D stage." In stage I, there is a large increase in the demand for a product which uses the raw material in its production. This derived demand leads to a substantial increase in the relative price of the raw material. In stage II, the relative price increase is slowed or the relative price actually falls as alternative world sources of supply for the raw material are opened up and users of the product replace it with cheaper alternatives. In stage III, research and development going on in the first two stages finally yields a synthetic alternative to the raw material or develops an important way to economize on the use of the raw material. In this paper, the cycle will be illustrated with references to three raw materials of very different types (one renewable and two non-renewable): a non-food agricultural product, rubber; a nonferrous metal, tin; and a nonmetallic mineral, industrial diamonds. We emphasize that the cycles described here are long-term (30 to 60 years) and may not apply to a number of raw materials. If no major surge in demand has occurred or if the price elasticity of supply is high, the

product is not a candidate for this analysis.

The historical examination of long cycles in these products yields seven implications. First, the eventual economic exhaustion of world supplies for a raw material does not imply exhaustion of the raw material. In addition to recycling, reclamation, and substitution away from a raw material whose price is rising, research and development provides two ways of extending the use of an important raw material: economies in use (e.g., the electrolytic process for making tin cans) and synthetics based on a more plentiful raw material (e.g., synthetic petroleum made from coal).

Second, the cycle provides a guide to the economics of shortages. Many current writers have extrapolated the implications of the energy shortage to long-run shortages in many raw materials. In each of the raw materials markets considered here, there was a "shortage" only during the derived demand boom. The raw material cycle illustrates the long-run microeconomic adjustment process following such a period and provides a useful framework for thinking about the future of petroleum. We are also less pessimistic than Club of Rome writers about future supplies of raw materials: shortages are short-run and not long-run phenomena.

Third, technological change is an important reason for the rise in the terms of trade of raw materials supplying countries in the boom period, and for decline in their terms of trade in the substitution and the R & D stages. A major technological breakthrough is the key to the beginning of the raw materials cycle: for rubber it was automobiles; for tin it was the invention of automatic canning machines; for industrial diamonds it was the development of cemented carbide metal cutting tools. In the second stage, the traditional supplier's terms of trade generally fall while the terms of trade of new marginal world suppliers may improve. In the third stage there is downward pressure on the terms of trade of the countries supplying the primary raw material as R and D economizes on the use of the raw material or provides a synthetic. An implication of this point is that increases or decreases in the terms of trade of any particular developing country

are related to the stages into which its raw materials fall. The post-war deterioration of several developing countries' terms of trade (cf. the Prebisch controversy) has coincided with the R and D stage for several raw materials.

Fourth, the long-run terms of trade have been constant for many raw materials for the first two-thirds of this century. The price of these products relative to the U.S. wholesale price index was virtually unchanged from 1900 to 1968. The third point above explains part of this phenomenon: increases in prices in the derived demand stage have been offset by decreases in the substitution and the R and D stages. Evidence from the product cycle suggests that endogenous R and D is an important force at work. A priori reasoning suggests that when the relative price of a raw material rises dramatically, research and development is undertaken to economize on it. When its relative price falls, less research and development is done on this raw material since the expected rate of return on this R and D falls along with the price. As a result, there is depreciation in the stock of basic knowledge about the raw material which exerts a minor but persistent upward pressure on its relative price. While we do not have the data to establish this proposition directly, we do have indirect evidence establishing the following point.

Fifth, technological advance is a substitute for international trade in raw materials. This proposition is based on the economic behavior we observe in developed countries during wartime. During wars, international trade in raw materials is disrupted and the shadow price in importing countries rises dramatically. The existence of war also generates an increase in the demand for raw materials in the belligerent developed countries. Both of these considerations generate a shortage of raw materials. In the international trade literature, this would be called "war-induced economic autarky." The developed countries respond by marshalling (usually by fiat) all of the economic forces described in the three stages of the product cycle to alleviate the shortage. They force substitution away from the raw material in civilian use and economize in military use; they seek

marginal sources of world supply held by their political allies; and they invest large amounts in research and development to conserve or synthesize the raw material. If the synthetic does not use as much in imported raw materials, R & D is thus anti-trade biased: it substitutes for trade. This phenomenon was important in Pacific trade during World War II. Japanese capture of the Far Eastern rubber and tin suppliers caused shortages of these raw materials in the West.

Sixth, for the raw material cycle, the locus of world production is the reverse of Vernon's manufactured goods cycle. For raw materials, production exists in the low-cost world sources (including a preponderance of developing countries) in stage I, spreads to both developed and other developing countries in stage II, and ends with increasing proportions of synthetic production in the developed countries in stage III. This implies that the pattern of trade is also the reverse of Vernon's cycle: for raw materials, developing countries are the main exporters in stages I and II and may become net importers in stage III.

Finally, emergence of a synthetic in stage III switches demand from the raw material being replaced to the raw material used intensively in production of the synthetic. This sets two new cycles in motion: production of the manufactured synthetic good starts through a Vernon-Hufbauer-type cycle (with production moving from developed to developing countries) while a new raw material cycle starts for the raw material used in producing the synthetic. For example, Conoco has synthesized a lubricant derived from dibasic acid esters which is superior to crude oil-based lubricants in cold climates. This shifts demand away from crude oil (a nonrenewable resource) and toward organic acids (vegetable fats).

In section 1 we develop the raw material cycle, using rubber, tin and industrial diamonds as historic examples. In section 2 we discuss the implications of the cycle for the economics of exhaustible resources. In section 3 we consider the long-run constancy in the relative price of raw materials. Section 4 develops the hypothesis that research and development is a substitute for international trade

in raw materials (via synthetics). Wars provide historical studies of the three stages of the raw material cycle compressed into a very short period of time. This is also instructive for a study of the economics of shortages since the stages of the raw material cycle are compressed into a short time period.

1. The Raw Material Cycle

Before describing the hypothesis, a word of caution is in order. Product cycles and stage theories are misunderstood and misused, both by their proponents and their opponents. Since stage theories are a form of inductive reasoning, they are tautologies when applied to the products on which they are built. By definition, stage I in our hypothesis begins when demand increases for the raw material; stage II begins with the increased geographical dispersion of world supply sources as marginal suppliers enter; and stage III begins with the commercialization of a synthetic or an economizing technological breakthrough. However, to the extent that our hypotheses are correct about the economic determinants of the stages, we have a meaningful behavioral model of the long-run dynamics of raw material markets. We turn now to a detailed examination of the cycle for rubber, tin, and industrial diamonds.²

Stage I: Derived Demand Boom

This stage begins when the market for a raw material is disturbed by an increase in the demand for a product which uses the raw material intensively. This change is usually a technological breakthrough, such as the development of a new product, or it may be a prolonged increase in demand. We define stage I to cover approximately the following periods for the three products:

rubber	1895 - 1910
industrial diamonds	1930 - 1940
tin	1895 - 1910

There are three distinguishing characteristics of stage I.

1. Stage I is defined by a technological breakthrough leading to a surge in the demand for final product. For rubber, the derived demand came from the increase in the demand for automobiles. Rubber was a candidate for automobile tires because of two earlier developments: Charles Goodyear's discovery in 1839 of vulcanization (combining heat and sulfur to produce a desired shape in rubber) and J. B. Dunlop's development in 1888 of the pneumatic tire. For industrial diamonds, there was growth in the 1930's and in the early 1940's in the demand for cemented (sintered) carbide metal cutting tools: from 1936 to 1942 the use of these tools increased by more than 50 fold (primarily due to World War II). For tin, demand was stimulated by the invention in 1895 of automatic can-making machinery. Because of the high price of tin relative to steel, cans are 98 percent iron or steel and less than 2 percent tin. Tin is used as the coating since it does not rust like the ferrous metals (both iron and steel are highly corrosive).
2. The increased derived demand leads to an increase in the relative price of the raw material. This is attributable to the large increase in demand and to short-term inelasticity in the supply of the raw material. The absolute price of rubber rose 78 percent from 1900 to 1910; tin prices rose by 144 percent from 1895 to 1910; diamond prices do not fit the cycle in this stage. There were continuous decreases in diamond prices in the 1930's following the high prices and speculative hoarding of precious stones in the late 1920's and the opening of mines in the 1930's stimulated by these prices (prices fell from \$61.42 in 1929 to \$2.90 a carat in 1940).
3. World trade patterns change in stage I: There is a surge in raw material exports from traditional world suppliers, the terms of trade of these countries increase and rents are created for the holders of raw materials supplies.

Firms may invest in R & D for synthetic or raw-material-saving alternatives in stage I but we have been unable to gather evidence of this historically. Before the present age of massive R & D, innovators

would probably attach large risks to R & D investments since markets had not yet exploited alternative supply sources and economies in use, both of which make a synthetic alternative less profitable.

Stage II: Substitution in Demand and Supply Sources

In this stage we observe the microeconomic effects following the increase in the price of any good: there are economies in usage and increases in nontraditional sources of supply, both of which exert downward pressure on the price of the raw material. Both of these forces have been at work during stage I but it takes until early stage II for supplies to catch up with the growth in demand. The substitution stage covers roughly the following intervals for the three products considered:

rubber	1910 - 1940
industrial diamonds	1940 - 1960
tin	1910 - 1945

There are four distinguishing characteristics of product market behavior in stage II.

1. This stage is characterized by the development of alternative supply sources and major changes in the patterns of world trade. By this we mean that the world regions which were the traditional suppliers (pre-stage I) and which obtained large rents in stage I begin to decline as a percentage of the total world supply for the raw material. This is not a tautological result based on the inevitable mathematical decline of a traditional country's share of world trade when new suppliers enter. For example, if the medium-run elasticity of supply of the raw material at the traditional sources is sufficiently high so that the price does not rise to the break-even point for the marginal world suppliers, then the traditional suppliers would remain the sole world suppliers of the raw material. However, for the products investigated so far, this has never proved to be the case. For example, in 1910, Brazil and Africa supplied over 61 percent of world rubber production. How-

ever, by 1930, Malaya, Ceylon, and Indonesia, which were all marginal suppliers initially, had captured 92 percent of the world rubber market. For tin the traditional suppliers were Indonesia, Malaysia/Singapore, and the United Kingdom: before 1895, these three sources supplied 95 percent of world tin production. In stage I, the share of these three regions fell to 70 percent of world production, and by 1936, the middle of stage II, their share fell to 36 percent. The important new suppliers of tin were Bolivia, Thailand, and Australia.

2. Another characteristic of stage II is continued economies in the use of the raw material because of the increased price in stage I. For rubber, average tire life was increased: initially, tire life averaged only about 10,000 miles, but improved tire construction increased tire life to 20,000 miles. Also, the proportion of raw rubber required per passenger mile was reduced significantly by adding oil, using reclaimed rubber and by recapping. For industrial diamonds, users substituted toward alternative hard cutting materials. For tin, there was increased secondary recovery of tin scrap: U.S. secondary tin consumption rose from 18 to 33 percent of total consumption from 1936 to 1945. There was also increased use of glass and paper containers (in stage III, tin-free steel, aluminum and plastics also emerged).
3. There is evidence in stage II of research and development leading to imperfect alternatives to the raw material or secondary recovery (recycling). For rubber, R & D breakthroughs in stage III (construction of radial-ply tires) made 50,000-mile tire life possible. For diamonds, General Electric was able to synthesize boron nitrate, which provided a grinding surface nearly as hard as that of an industrial diamond. Another alternative was the development of ultrasonic abrasive grinding. Secondary recovery was made possible by the development of electrostatic separation processes which permitted firms to recover the diamonds from old grinders (this procedure has permitted as many as two million carats a year to be recovered since 1962). All three of these

factors generated important savings in the use of diamonds.

4. In the substitution stage substitution and supply growth adjusts to demand growth (so that the relative price is constant) or these forces may place downward pressure on the raw material's relative price. The relative price of tin was virtually unchanged from 1910 to the 1940's while world consumption of primary tin increased from 117 to 149 thousand metric tons. The relative price of rubber fell substantially from 1910 to 1940 while primary rubber consumption rose from 103 to 1128 thousand metric tons.
5. As a result of the four points above, demand can continue to grow for a long period with pressure on either constant or declining relative prices of the raw material. This erodes the rents of both traditional and new marginal suppliers. Suppliers may engage in collusive action in stages II and III to limit supplies and drive up prices (there may be rational reasons for not doing this in stage I). In 1917 the rubber plantation companies in Malaya cut back output to 75 percent of capacity because of inadequate shipping facilities caused by the War. In 1922 a compulsory restriction scheme was adopted in Malaya and Ceylon. By November of 1925, the British rubber restriction scheme had succeeded in raising the price from 8d to 4s a pound. However, by 1929, the relative price of rubber had fallen below its level in the early 1920's. In 1929 and 1930, many of the commodity agreements of the 1920's collapsed. However, they began to re-emerge in the early 1930's. In chronological order, the new schemes were initiated as follows:

February	1931	Tin
May	1931	Sugar
April	1933	Tea
August	1933	Wheat
June	1934	Rubber
January	1936	Copper

We turn now to stage III, in which an important R & D breakthrough appears.

Stage III: Synthetic and/or R & D Incursion

This stage begins whenever research and development leads to either a highly substitutable alternative to the raw material (such as a synthetic) or an important raw-material-saving technological change (to be distinguished with the minor R & D developments in stage II). There is an increase in total use of the product since the synthetic lowers the price. In the case of synthetics, there is an increase in the share of the synthetic and a decrease in the share of the original raw material itself. Most importantly, in stage III the new synthetic starts through a Vernon-type product life cycle of its own. Stage III covers the following periods for the three commodities considered:

rubber	1940 - present
industrial diamonds	1960 - present
tin	1945 - present

We turn now to five characteristics of economic behavior in stage III.

1. As noted, this stage begins when some alternative to the raw material appears either as a synthetic or as a raw material-saving production process. We have known since the 1870's how to synthesize rubber. However, it was not until the 1940's that this process became profitable. The largest encroachment of synthetic rubber into the rubber market began in 1955 when the United States government released its synthetic rubber works to the private sector. Since then there has been a dramatic decrease in the price of rubber due to synthetic incursion. For industrial diamonds, the big breakthrough occurred in 1955 when General Electric succeeded in synthesizing diamonds. The successful process was the application of massive temperatures and pressure to pure carbon. At present, G.E. has plants for synthesizing diamonds in a number of countries (South Africa, Ireland, Japan, and Sweden) and the Soviet Union has a synthetic diamond operation. For tin, the big breakthrough was not a synthetic alternative but a raw-material-saving technological change. It permitted a switch from attaching tin to iron or steel cans via hot-dip plating to

the electrolytic process. With hot-dip plating, tin is 1.5 percent of can weight; with electrolytic plating tin weight falls to only .25 percent, a substantial saving. A close but imperfect synthetic alternative to tin, introduced in 1965, is low corrosive tin-free steel. This has permitted cans to be made out of steel itself and requires no tin plating. Aluminum is also used now in place of tin-plated cans. These developments partly helped economize on tin, whose price rose dramatically in the mid-1960's because of the Vietnam War.

2. A second characteristic of stage III is a decrease in the share of the original raw material for synthetic breakthroughs or a decrease in absolute consumption of it for economies in use. For rubber, the synthetic share of total rubber consumption was 20 percent in the 1940's; by 1962 its share was up to 50 percent and it had risen to 65 percent by 1970. For diamond, we have no direct evidence on the proportion of synthetic versus natural diamonds, but data only on total world consumption of all industrial diamonds. The indirect evidence is the surge of the quantity of world consumption of diamonds, probably caused by synthetization: world consumption of both types of industrial diamonds increased from 22 million carats in 1960 to 30 million carats in 1964. World consumption then remained constant over the next four years at the 1964 level. From 1955 to 1968, the price of diamonds was virtually constant (\$4.39 to \$4.41), meaning that their relative price fell. For tin, the electrolytic process developed in the early 1940's contributed to a decline in the world consumption of tin from nearly 149,000 (long) tons in 1940 to below 100,000 tons in 1945.
3. The decline in the price of the raw material leads suppliers to engage in collusive behavior. Although there have been important international agreements for wheat, sugar, and coffee in the post-World War II period, we only have evidence for one of the three commodities studied here, tin. There have been three

International Tin Agreements, each of which involved 20 or more countries: the first was in 1956, the second in 1961 and the third was in 1966.

4. The most important aspect of stage III is that the new synthetic material begins a life cycle of its own. It parallels the Vernon (1966) product cycle for manufactured products. Hufbauer (1966) has described and tested alternative hypotheses about the patterns of production and trade for synthetics. While his results are not presented in stages as were Vernon's, they certainly support a life cycle approach to synthetics. The most important implication of Vernon's cycles is that production moves from the innovating country to other developed countries and finally to low-wage developing countries as the synthetic ages. Hufbauer (1966, Appendix Table C-3, pp. 131-134) has tabulated the first date when each country begins producing 56 synthetics. His data for synthetic rubber (and many others) is consistent with a synthetic cycle:

Table 1

Date of First Production by Country for Styrene Rubber

1941	United States
1943	Canada
1953	Germany*
1956	France
1957	Italy
1958	United Kingdom
1960	Japan
1960	Netherlands
1960	Brazil
1961	Australia
1965?	Mexico

*Germany produced synthetic rubber before and during WW II but lost those plants to Russia at the end of the War.

Additional evidence for the predominance of developed countries in the production and export of synthetics is presented in Table 2.

Table 2
Production and Export of Synthetic Materials
as a Percent of World Total

Year	Production			Exports		
	USA	Germany	Developed Countries	USA	Germany	Developed Countries*
1924	32	27	93	3	22	75
1938	21	29	95	9	20	87
1950	60	7	88	22	8	65
1960	44	13	86	34	18	82

*U.S., Germany, U.K., France, Italy, and Japan.

Source: Hufbauer (1966, p. 42).

The cycle here differs from Vernon's manufactured products cycle in that the raw materials are of greater importance for synthetics. But this is a virtue empirically, since it speeds the movement of production to the developing countries. In Vernon's cycle, low wages lure production to developing countries. For the synthetic cycle, both low wages and cheaper raw materials are an inducement.

In fact, a puzzle is why production does not move to the raw material source more rapidly. Hufbauer (1966, p. 15) provides several examples. Canada was not a major exporter of viscose rayon in the 1960's despite its large supply of pulp wood. In the 19th century, Formosa and Japan were major world suppliers of camphor, but Formosa never produced celluloid (the first plastic discovered, whose production requires large amounts of camphor), and Japan did not begin production until 1968, forty years after the United States. Kuwait did not

build a polyvinyl chloride plastics plant until 1963 (32 years after Germany), or a styrene rubber plant until 1965 (24 years after the United States). Both of these synthetics are petroleum based. We must presume that economic factors enumerated by Vernon cause developed country production to dominate (the skilled labor intensity of new production, importance of close interaction of producers with users, etc.).

Hufbauer provides two other reasons. First, there may be economies of scale in production so that large producers would have a cost advantage over smaller producers. In a world of tariff and transport cost barriers to international trade, large economies like the United States and Germany can produce more efficiently than small economies. Hufbauer (1966, chp. 5) found statistical support for the scale economies theory of synthetic trade: The size of home markets was the best variable explaining five-year export share changes for all types of synthetic trade (1952 to 1956 and 1957 to 1962). Since the correlation between the degree of development and the size of economies is positively correlated, the results in Table 2 are explained.

Second, trade in Table 2 can be explained by an imitation lag theory. This explanation is consistent with a synthetic cycle while the economies of scale approach is not. Economically advanced countries are more likely to innovate because of their superior endowments of human capital. Imitation is easiest for other economies with large endowments of skilled labor (other developed countries) and hardest for countries with small endowments (developing countries). This results in synthetic production moving to the developing countries last. This, however, is a short-run theory of trade determination. In the long-run all countries will know the production process and costs will determine the location of production (Hufbauer calls this "low-wage trade"). Hufbauer (1966, chp. 6) also

confirmed these hypotheses: the United States specializes in exporting newer synthetics and, for world trade, the proportion of low-wage trade increases with the age of the synthetic.

5. Finally, the new raw material which is used intensively in production of the synthetic can begin a raw material cycle of its own: initial shortage, spreading economies in use and diversification of world supply, and ultimately an R & D breakthrough providing an economy for this raw material, a substitute for it, or a synthetic.

2. Shortages and Exhaustible Resources

The raw material cycle emphasizes that the linkages between raw materials and their ultimate uses in final products constantly change through time. When a raw material shortage develops, there are many links which can adjust between raw material suppliers and final consumers: people cut back on their consumption of final products; suppliers can look for more sources of the raw material; new ways can be discovered to economize on the raw material inputs; changes are induced in the production functions relating raw materials inputs and outputs; and synthetics are developed. Because of these many links between inputs and outputs, and the complex relationship between them as explored in the raw materials cycle, we are more optimistic than the Club of Rome. Consider the following quotation from the Second Report to the Club of Rome:

Is there any reason to believe that the crises of our era will not be resolved as successfully as the crises of the past were resolved? Is there any reason why we should not go about our business as usual, confident that the precedents of the past will apply to the future, and that all our crises will be taken care of in due time?

The answer to these questions is yes, there is ample reason to believe that the problems of our time will not be solved in the routine course of events. For one thing, the numerous crises of the present exist simultaneously and with a strongly woven interrelationship between them. We do not

have the luxury of dealing with one crisis at a time. Furthermore, the scale and global character of the present crises differ from the nature and scale of most past crises. . . To reduce human labor by exploiting the non-human energy sources in Nature, for example, was a goal no one quarreled with but it led to the present energy crises. Mesarovic and Pestel (1974; pp. 10-11)

Our view is that the long-run relationship between the stocks of all natural resources which might fulfill a given end and the endogenous market-directed nature of the technology relating them to outputs is a more important focus for investigation than emphasis on the absolute physical limit of each resource on the planet. Known reserves are not fixed: they depend on prices and technology, both of which are continually changing. The elasticity of supply of known reserves is discussed in the report of the Paley Commission in 1951. The Commission estimated that recoverable coal reserves amounted to some thirty billion tons. They estimated that at prices fifty percent higher, reserves which were worth recovering were no less than twenty times greater than the thirty billion ton estimate.⁴ Regardless of whether the number is 5, 20, or 50 for coal, the point is that the relevant consideration is the long-run elasticity of supply of all raw materials, with both prices and technology endogenous. The raw materials product cycle emphasizes that technology is endogenous and an important market-clearing variable for natural resources.

It is ironic that the question of the long-run exhaustion of energy and natural resources which is widely discussed today is the very problem which technology and markets have been addressing for the last one hundred years. Our energy crisis started more than a century ago: in 1850, wood supplied more than 90 percent of fuel-based energy and mineral fuels; in 1915, coal supplied 75 percent of energy requirements; in 1970, petroleum and natural gas supplied over 80 percent.⁵ Rosenberg documents how the iron and steel industry grew to economize on the shortage of wood in the 19th century. Our view is that the current energy flap is just the beginning of another change in the energy cycle, with the Arabs playing a temporary catalytic role.

We have the same view on the broader question of all resources.

The finiteness of supply has been a continuing feature of modern economic history. In fact, per capita consumption of resources, including agriculture and timber along with minerals, has increased only 55 percent in the past 100 years. Consumption increased from \$174 per capita in 1870 to \$221 in 1900 and to \$270 in 1954 (all in 1954 dollars). Our consumption of resources has also been continually declining as a share of output: output of resources as a percent of GNP has fallen from 36 percent in 1870 to 27 percent in 1900 to 12 percent in 1954.⁶

The point is not that history implies no future problems. Rather, it is that the rising prices for raw materials, even several at once, does not necessarily signal a "discontinuity in history" or the beginning of the age of Malthus. Our feeling is that if relative prices stay high, this will stimulate investments in new technology for several raw materials. In the next section, we investigate the constant long-run terms of trade of several raw materials. Section 4 shows how raw material shortages have been addressed in wartime.

3. A Constant Long-Run Terms of Trade?

Through the raw material cycle, there is a sequence starting with pro-trade biased growth in stage I and ending with anti-trade biased growth in stage III. The locus of world production shifts from the traditional (usually developing) countries' suppliers in stage I to these traditional suppliers plus other marginal sources (both developing and developed countries) in stage II to an increasing proportion of developed country production early in stage III. As noted in section 1, the developed countries dominate production and export of synthetics. However, this is only early in stage III since the synthetic goes through a Vernon-type cycle of its own. What happens over the raw materials cycle to the terms of trade of the developing countries?

In stage I the raw materials terms of trade (the ratio of the raw materials price to the price of all other goods) increases because of

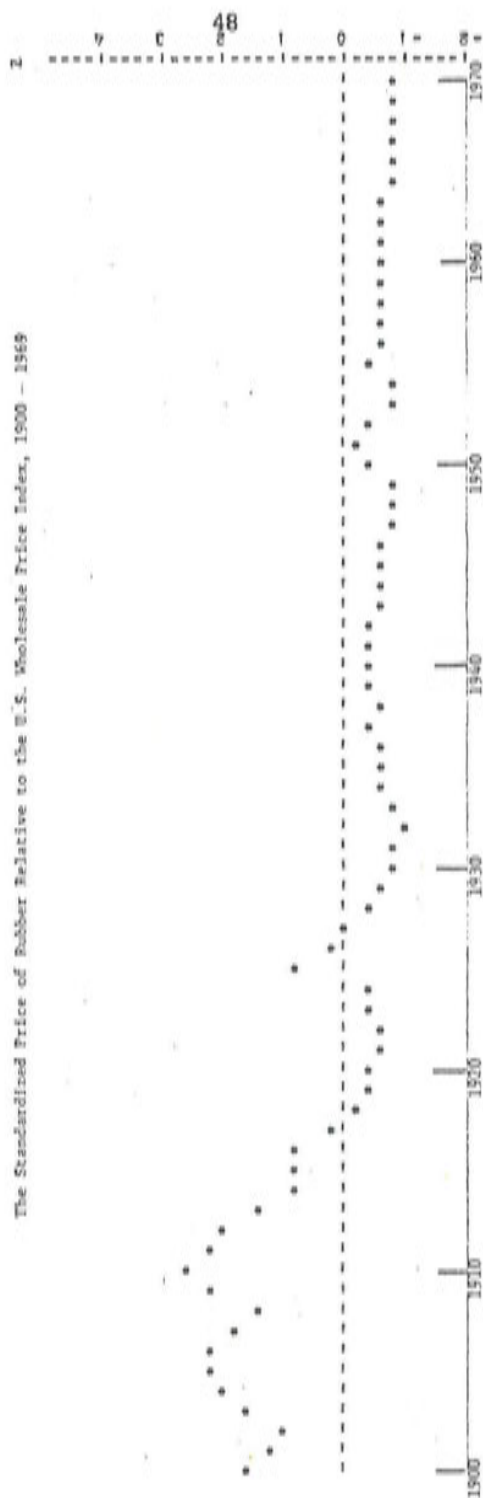
the expanded demand in the developed countries for the raw material. In stage II, they will level off or decline from the high point reached in stage I (although their level is still higher than at the beginning of stage I). In stage III the terms of trade fall precipitously because of the introduction of the synthetic. The relative price of the raw material at this point may be even lower than before the cycle began. The terms of trade of developing countries throughout stage III are hard to describe because the synthetic material itself starts through a cycle of its own. While we know that the terms of trade of the original primary raw material continue to fall, the price of the raw material used intensively in the production of the synthetic begins to rise as in stage I. Thus, the cycle begins again with a different set of producing countries benefitting.

The terms of trade for rubber and tin are shown in figures 1 and 2, respectively. Zero denotes the average for the relative price index for the entire period from 1900 to 1970. Notice that for rubber, the price was high for the first 16 years of the century and remained relatively constant from 1920 until 1970. For tin, the shortages of the late 19th century were not in evidence. The relative price of tin shows an amazingly trendless rate from 1900 until the mid-1960's, when it began to rise.

We investigated the long-term constancy of the terms of trade of seven raw materials, including tin. These are shown in Table 3. Notice that four of the raw materials have a lower price in 1976 than they had in 1900, while three of the seven have a higher relative price. For only one of the products, aluminum, does it appear that the relative price is significantly lower in 1976 than it was in 1900. Generally, it appears that only one other product has a significantly higher price in 1976 than in 1900 (tin). Aluminum is one of the most abundant sources of metal in the earth's crust, replacing iron and steel in many applications, such as canning. Tin is currently regulated by the International Tin Council, the world's longest standing international commodity agreement. However, there are some difficulties since Bolivia, the world's second largest tin-producing

Figure 1

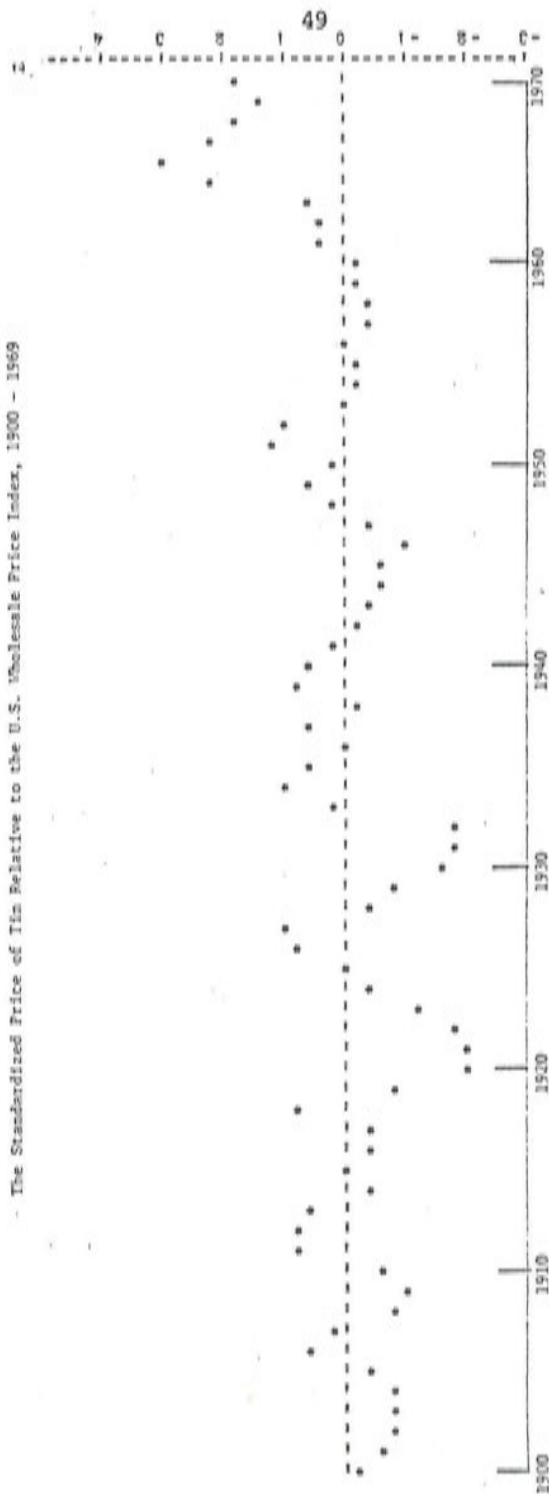
The Standardized Price of Rubber Relative to the U.S. Wholesale Price Index, 1900 - 1969



Let x_t equal the price ratio for a given year. The standardized value z equals $(x_t - \bar{x})/\sigma_x$, where \bar{x} is the mean of the price ratios for 1900 - 1969 and σ_x is the standard deviation.

Figure 2

The Standardized Price of Tin Relative to the U.S. Wholesale Price Index, 1900 - 1969



Let x_t equal the price ratio for a given year. The standardized value z equals $(x_t - \bar{x})/\sigma$, where \bar{x} is the mean of the price ratios for 1900 - 1969 and σ is the standard deviation.

Table 3

The Price of Seven Raw Materials Relative
to the Price of All Other Goods
(1900 = 100)

	Aluminum	Copper	Lead	Mercury	Silver	Tin	Zinc
1900	100	100	100	100	100	100	100
1910	54	63	81	73	69	90	99
1920	36	39	67	58	60	58	64
1930	47	52	83	146	40	68	68
1940	41	50	85	246	41	118	104
1950	19	46	108	56	43	112	113
1960	24	60	84	125	45	103	91
1970	23	94	95	214	76	152	95
1976	22	68	84	38	117*	187*	136
mean	43	61	91	124	62	110	98
standard- deviation	27	19	17	62	20	31	27

*1975 was the last year reported.

Each index is the price of the mineral in the New York relative to the U.S. wholesale price index. The mean and standard deviations are based on 77 annual observations from 1900 - 1976 (76 for silver and tin).

Sources: The annual prices for the minerals from 1900 - 1968 are from Metals Week (1970); prices from 1969 - 1976 are from American Metal Market (1977). The wholesale prices for 1900 - 1970 are from Bureau of Census (1976) and 1971 - 1976 are from Council of Economic Advisers (1977).

The year 1900 was chosen as a base because it was the earliest year for which comparable data was readily available for several products. We have no information on how "normal" or "abnormal" it is, relative to previous years.

country, refused to ratify the 1976 agreement. Despite recent supply shortages, there is little concern that tin might be in short supply over the long term.⁷

We advance the hypothesis here that when any major relative price change occurs, research and development will be reallocated from areas formerly in short supply to areas currently exhibiting shortages. Our impression from the qualitative evidence is that R & D and technical change are important variables equilibrating raw materials markets in the long-run. This makes forecasts of the Club of Rome variety difficult since the technology leading to stage III is not always contemplated in stage I. We do not have hard evidence, but we suspect that in stage I, tin markets were not aware of electrolytic plating and that diamond markets did not anticipate synthetic boron nitrate, ultrasonic abrasive grinding and electrostatic separation processes. Rubber is a bit of an exception since some processes for synthesizing rubber have been around since the 1870's, but they were not commercially feasible. The important point is that the markets cannot know in advance which specific technical breakthroughs will occur; but they can probably predict better than most econometric models or futuristic simulations based on historically developed feedback rules that some breakthrough is likely. The current price of raw materials will incorporate the probability and the expected timing of some breakthrough as well as its probable economic importance.

4. Research and Development as a Substitute for Trade

One of the more interesting experiments in a study of the economics of shortages is to observe what happens to raw materials during wartime. Wartime is a massive acceleration in the speed with which items move in the cycle, except that they are applied to a single country. In Table 4, we list several important raw materials which were developed during wartime or were war related. These include not only synthetic rubber but cotton substitutes, liquid fuels from coal, and some plastic fibers. A number of difficulties which the Germans

Table 4
War Related Synthetics

Methyl Butadiene (first synthetic rubber)	}	Germany, WW I (to counteract the blockade)
Viscose Rayon Staple (cotton substitute)		
Glass Filament Fibers (substitute for asbestos)		
Liquid fuels from coal (hydrogenation and methanol synthesis)		Germany, 1920's, (in response to fuel shortages in WW I); used extensively in WW II
Styrene and Nitrile (synthetic rubbers)	}	Germany, 1934 (extension of research on WW I rubber synthetics by T. G. Farben)
		U.S. and Canada, WW II (opened large styrene rubber plants)
Polyurethane (rubber)		Germany, WW II
Silicone and Nylon (1941)	}	U.S., WW II (specialty plastics)
Polyester (1942)		
Fluoroethylene (1943)		

First Production Date During Wartime
(degree of war relatedness unknown)

Cellophane (cellulosic plastic)	France, 1917
Epoxy (thermoset plastic)	Switzerland, 1944
Polyvinylidene Chloride (thermoplastic plastic)	U.S., 1940
Saran (fibre)	
Butyl (rubber)	U.S., 1942
Acrylic (fibre)	U.S., 1943

First Produced in Germany in the 1930's
(degree of war relatedness unknown)

Cellulose Acetate Butyrate	1935
Ethyl Cellulose	1932*
Methyl Cellulose	1932*
Melamine Formaldehyde	1935*
Polyvinyl Chloride	1931*
Polystyrene	1930*
Polymethyl Methacrylate	1930*
High Tenacity Viscose Rayon Filaments	1935*
Acetate Staple	1932

*Germany was also the first country in the world to produce these synthetics

Source: Hufbauer (1966, pp. 131 - 132)

experienced in World War I were not repeated for World War II. They spent a lot of research and development on both synthetic fuels and rubber and other synthetics. In fact, you could almost bet the German war machine developed in the 1930's on their successful exploitation of research and development as a supplement to their own raw material base. On September 1 of 1939, 38 percent of German fuels were synthesized: 32 percent by hydrogenation, and 6 percent by the Fischer-Tropshe process for extracting liquid fuel from coal. An untested hypothesis is whether the German reparations payments in the 1920's cut back on raw material imports sufficiently to explain the R & D which led to the German synthetic discoveries in the 1930's (see Table 4).

Either wartime or reparations-induced cutoffs of raw materials impose economic autarky upon markets previously served by a combination of imports and domestic production. International trade theory has not explicitly accounted for R & D investments which change the production function and develop synthetics when autarky is imposed. The implication is that the gains from trade are lower (or the loss from a cutoff in trade less) in countries with a relative abundance of human capital.

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FOOTNOTES

¹The authors are Professor of Finance, the University of Texas at Austin and Brokerage Supervisor, Unionmutual, Oakland, California. They are indebted to Ken Bishop, Ann Winters and Carol Nackenoff for research assistance and to Hugh Patrick for comments. This paper builds upon earlier work: Robins (1971) and Magee and Robins (1977).

²For tin statistics in this section see International Tin Council (1970); for rubber see International Rubber Study group; for industrial diamonds see U.S. Bureau of Mines.

³World consumption of primary tin stayed below 1940 consumption levels until 1960 (with the exception of one year.)

⁴Rosenberg (1973).

⁵Rosenberg (1973) and Council of Economic Advisors (1974).

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THE RAW MATERIAL PRODUCT CYCLE

A COMMENT

Danny Leipziger*

The Magee and Robins paper is what I would call a paper aimed at reporting what is and offering some explanations as to why. It does a credible job within these confines but it does not venture into the interesting policy issues facing a developing country producing a commodity whose price may face short-run instability and secular decline. If the raw materials product cycle theory is correct, then producers will experience declines in price due first to the increased competition of additional supply and second to the development of synthetic substitutes.

Parts 1 and 3 of the paper address the role of a product cycle theory applied to the cases of natural rubber, tin and industrial diamonds, hypothesizing that secular prices fell in harmony with theory. Parts 2 and 4 digress into a largely speculative discussion of global resource supply over time and a largely extraneous discussion of World War-induced innovations. I will address myself to the basic premise of the paper -- that the raw materials product cycle can explain price movements in resource industries.

In applying the Product Cycle Theory of international trade popularized by Vernon and others¹, it seems to me that the authors do not take into account some of the underlying structural differences between advanced countries (DCs) and developing countries (LDCs) that enriched the Product Cycle Theory. What rendered that concept so

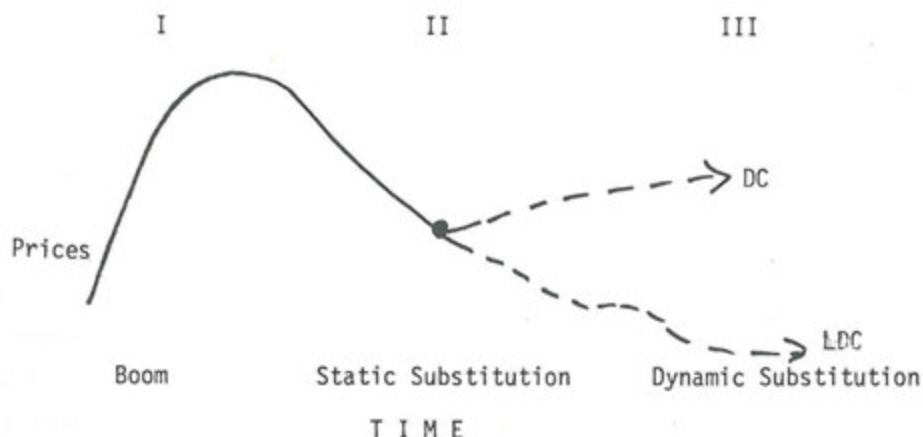
*The opinions expressed by the author do not necessarily reflect those of AID.

applicable to international trade was the incorporation of differences in product, skill requirements, and demand factors over time. No such subtleties are incorporated in the Magee-Robins paper.

As an example of what might conceivably be added, let me propose that Stage II -- the phase of increasing competition in supply which tends to depress prices in the absence of similar growth in demand -- is the crucial phase for suppliers and a phase in which DCs respond quite differently from LDCs due to structural factors in their economies and internationally. More advanced countries can respond to depressed prices by diversifying production -- diverting resources into alternative industries -- and by engaging in downstream processing. During Stage II, the response to a downward price trend forces some producers to adjust; others cannot. To treat all commodity producers equally is to reduce unnecessarily the applicability of the model. Figure 1 depicts this situation graphically.

Figure I

Raw Materials Product Cycle



Empirical studies clearly show a greater concentration in primary commodity production in the world's poorer nations, those lacking the capital and expertise to diversify their productive base. UNCTAD data reveals the degree of LDC concentration in primary commodities, as shown in the attached table.

Quite often the lack of diversification is a vestige of a colonial past. In recent years, however, it results more from a lack of domestic capital and a mistrust of foreign investment in raw materials production. For this reason, new forms of cooperative investments in raw materials need to be found.²

With respect to the ability to engage in downstream processing, a recent report prepared for UNCTAD analyzed a set of obstacles to such processing in four representative raw materials -- iron ore, copper, timber/wood products, and hides and skins.³ The major obstacles in the iron ore industry were deemed to be the capital requirements, the technology and labor skill, energy, and supply of complementary materials.

With respect to copper, the obstacles of greatest consequence to LDCs were low value -- added to lack of proximity to consumers and capital requirements. With respect to processed wood production, the factors were tariffs and non-tariff measures, capital requirements, and product and marketing differences. Finally, in the case of hides and skins, the major obstacles were trade barriers (tariff and non-tariff) and transport costs.

What emerges from the study is the fact that downstream processing presents several major generalized obstacles to LDCs including inadequate capital and technology and barriers to developed country markets. Studies showing that effective rates of protection are higher as the degree of processing increases reinforce the views that LDCs face difficulties in diversifying into processed products whose prices are less volatile in the short-run and whose long-run projects (based on larger income elasticities of demand) are more favorable.⁴ Thus, the ability of a developing country to adjust to secular price declines within a product cycle framework is far less than for a more advanced country.

In measuring the secular pattern of terms of trade for producers, it might be interesting to use an alternative price deflator (if available) to the U.S. wholesale price index which is weighted heavily towards the U.S. production bundle of goods rather than towards the producers import bundle of goods. The second point with respect to measurement is that it might be quite interesting to look at the terms of trade unadjusted for normal variation to gauge the short-term volatility of prices. It is to some degree the instability in earnings from raw materials that may hinder the LDCs' ability to undertake the investments necessary to either diversify its output or process it.

The issue of short-term price stabilization has received considerable attention in the literature and also in practical terms.⁵ Short-term price instability, often associated with business cycle fluctuations, may be of considerably more policy relevance than long-term price trends. Current UNCTAD discussions on common funding arrangements for some buffer stocks would attempt to ameliorate some price problems. Alternatives to these arrangements have been suggested, such as long-term supply contracts.⁶

The objective of any of these arrangements is to add certainty to prices in stages II and III. I would assume that most LDC producers now find themselves in either stage II or stage III of the cycle and the prime issue is what their policies and the international community's policies should be.

FOOTNOTES

¹R. Vernon, "International Investment and International Trade in the Product Cycle," Quarterly Journal of Economics (May 1966).

²In this respect, mention can be made of the abortive International Resources Bank, increased World Bank lending in minerals and energy, and new forms of joint investment as noted by D. Smith and L. Wells, Negotiating Third World Mineral Agreements (Ballinger, 1976).

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THE RAW MATERIAL PRODUCT CYCLE
A COMMENT

Narongchai Akrasanee

It is the tradition of the Pacific Trade and Development Conference to start off the program with a paper which provides a framework for the discussion of the entire program. If we consider this paper as the guideline, I think that we are going to have a very enjoyable conference. This is because, according to the authors, the problems of raw materials as we know of them today either do not exist, or if they exist they are not that serious, or they are not the real problems. What are the problems which are talked about most these days?

(1) The world is going to run out of certain raw materials.

(2) Worsening terms of trade of raw materials.

The authors developed a very ingenious theory of the product cycle which basically denies the existence of these two problems. In my comment I will first discuss the product-cycle theory of raw materials, and then I would like to comment on some of the implications of the analysis.

On the whole, I think it is extremely useful to have a simple theory to explain an important phenomenon, and the authors should be congratulated on their contribution. The periods and the incidents cited to explain the cycle are well substantiated. However, before a cycle theory is accepted one has to be sure that a series of events are going to repeat themselves in other cases. The events are (1) the invention of a certain product which requires the use of a raw material, (2) the increase in price which leads to new supply and substitution of a particular raw material and (3) the R & D which leads to the use of a synthetic substitute.

These events are to take place because of economic reasons. Event number 1 is necessary as the starting point. It is event numbers 2 and

3 which I think may not always be in that order. Research and development take place continuously, and could lead first to substitution or to the invention of synthetics, although logically the order of occurrence should be as the authors suggested. Perhaps more case studies are needed here, and a statistical test which can be performed to prove the order of occurrences.

Furthermore, in terms of methodology, I do not think the authors have provided enough statistical tests to substantiate their claim, especially in Stage III, when R & D is said to lead to invention of a synthetic -- or a major raw material saving device (i.e., At what price will this take place? Is it random?, etc.).

Let me come now to the implications of the theory and other aspects of the paper. The theory implies, among many other things, that whatever happens we will not run out of raw materials. On first appearance this is a comforting thought. But is this more because a synthetic will always be produced, or because a technology will be developed to save on the use of raw materials? Is there a bias in the R & D system towards the synthetic? Any visitor to America certainly feels that way.

For developing countries, the cycle theory does not offer an encouraging sign. As net exporters of raw materials, the theory simply says that the price will go up and down, and up again if they are fortunate, or up and down and up and down, which is even more unfortunate. The point is that those changes are generally not under the control of the exporters. Later on in the cycle, when developing countries became net importers of synthetics, they were again at the mercy of the corporations which produced those synthetics.

On the aspect of the long-run constant terms of trade, the implication of the theory is that they would be constant. This is because the increase in price will shift from one raw material to another. So in total, the terms of trade average out about the same. For net exporters of raw materials, this conclusion is supposed to be better than the worsening terms of trade thesis. I think, however, it would be an important addition if the authors would include an analysis

of the short-run terms of trade of the product-cycle theory. As the evidence in their Table 3 shows, the variation in prices of raw materials from decade to decade relative to all prices has been very high. It is this short-run, commodity-to-commodity change which worries developing countries the most. It would be interesting to learn how the product cycle theory predicts the short-run changes. I think, according to the theory, we would have in Stage I a shift in demand. The effect on price would depend on the elasticity of supply, which varies from commodity to commodity. Then in Stage II, the supply curve would shift to the right, and demand to the left. Finally in Stage III, demand shifts to the left again. The effect on price fluctuation depends, therefore, on the elasticity of both demand and supply within the range of the previous equilibrium. The understanding of this mechanism has a very important implication for the stabilization program. As is being discussed at various places at the moment, in certain cases price stabilization could lead to a stabilization or a destabilization of income, depending upon the elasticity of demand and supply. I think the product-cycle theory could provide some insight on this problem.

THE RAW MATERIAL PRODUCT CYCLE

GENERAL DISCUSSION

The authors acknowledged that their paper did not deal with the policy problem of adjustment to a secular decline in the terms of trade, since this was outside its scope. They noted, however, that a major implication of the paper was that a raw materials export boom, and an accompanying rise in the terms of trade, was strictly a short-term phenomena, and that for the long run resource exporting countries should seek to diversify their economies. The problem facing developed countries was probably less severe since they had more opportunities for diversification and downstream processing.

Participants generally agreed that the author usefully modelled broad historical developments in raw materials markets. However, several -- in addition to Narongchai Akrasanee -- thought that the particular selection of stages of the raw materials cycle was arbitrary. For some commodities, such as wood, there might be a stage prior to the "boom stage" in which raw materials were exploited domestically by industrial countries before being imported. In this case, the raw material cycle is in phase with Vernon's cycle for manufactured products. For other commodities, such as rubber, substitution in stages II and III may be incomplete, and the cycle less pronounced. There may also be a Stage IV -- a new burst in derived demand following an expansion of per-capita income of LDC's. Finally, there may be cycles within cycles. For example, the development of thin-plated tin to economize on the usage of this raw material resulted in a new derived demand for the plate. Also, higher energy prices could be a disincentive for using synthetics, which are energy-intensive, and result in a new rightward shift in the demand curve for raw materials. The authors rebutted that they were less interested in identifying and naming stages, than in explaining the fundamental economic forces at work. They commented that an analysis of a possible

Stage IV was difficult in view of the uncertain rate of change in the structure of world demand and in technology.

Other participants doubted the universality of the cycle, and wondered if the selection of commodities for analysis was arbitrary. How many commodities did not fit the cycle theory? Someone remarked that objective indicators were required to identify the stages of the cycle for individual commodities. Movements in relative prices seemed reasonable indicators, but the three commodities analyzed in the paper revealed three different patterns of relative price changes: The relative price of rubber rose in Stage I and fell in Stage II; that for tin rose in Stage I but remained constant in Stage II; and that for industrial diamonds actually dropped in Stage I. The authors argued that relative prices were an appropriate indicator for tin and rubber, but that industrial diamonds were a special case in which early new explorations of diamonds in South Africa depressed world prices, which may in itself have initiated the cycle. The authors stated there were several other commodities which fitted the cycle theory well, but that it was difficult to find many such commodities because of extensive government interference in markets. They planned in the future to analyze the case of petroleum. Another participant echoed the authors' warning on the misuse of stage theory, and further warned that the existence of a contradictory case does not invalidate the application of the theory to cases which do seem to fit well.

Another participant seconded Leipziger's criticism that the authors' terms-of-trade measure was inappropriate for measuring welfare effects or for indicating changes in market conditions. It would be more appropriate to analyze export unit values and in particular, the stability and secular behavior of both the domestic and foreign components of these. A useful distinction for this purpose is the distinction between the "return to value terms of trade," which measures the component of export unit value returned domestically, and the "net barter terms of trade."

Higher relative prices of a raw material induce substitution in both production and consumption, and also R and D in economizing technology and/or synthetic substitutes. Two participants thought

that short-run price volatility, which increases costs of investment, may be an equally important stimulus to R and D. Thus, schemes to stabilize prices may slow the transition to Stage III of the cycle and may also achieve a long-run balance between supply and demand.

Several participants wondered what determines the speed of the cycle. In general, the speed of adjustment depends on elasticities of demand and supply, and the elasticity of technological change. These parameters differ across commodities. Changes in market prices may affect multinational corporations differently than producers who are less integrated. In particular, multinationals may make internal adjustments to minimize the impacts of price volatility, and this may slow the R and D response. Stage II may be speeded by a fear of interrupted supply. In Stage III, higher energy prices might make synthetic substitutes, which are typically energy intensive, less attractive and slow the transition to Stage III.

Many participants thought that the paper did not adequately address short-run adjustment problems. The model implies that supply shortages are not a problem in the long run, but this may not be true in the short or intermediate run. An example is the lead time needed for a transition from crude oil to synthetic liquid energy. There is likely to be a severe shortage of crude oil in the 1980s and it is unlikely that market response alone would be sufficient. Thus some government intervention may be necessary to speed up the cycle. The authors replied that speeding up of the cycle is not always efficient (for example, war is a very inefficient method of speeding this cycle), and a case must be made on an individual basis to do so. Another participant argued that government intervention might actually frustrate market responses; for example, controls in the U.S. oil industry which raise prices for consumers but which do not correspondingly raise the return to producers.

A participant differed with Leipziger's comment that the discussion of wartime technological change was extraneous, since it supported the important conclusion that scarcity under any conditions leads to R and D. Another thought the argument that countries

relatively abundant in human capital will suffer lower losses from a cutoff in trade was fallacious, since the human capital may be more efficiently allocated to other products than those which substitute for traded resources. One participant doubted that the implication of a constant long-run terms of trade fitted the facts, as opposed to a secular decline. Another thought that it did fit the facts, but that a more important question was whether the theory can really explain long-run movements in terms of trade without an explanation of factor price determination, in particular an analysis of markets for human and physical capital. The authors agreed this was important.

MINERAL TRADE AND INVESTMENT PATTERNS IN THE PACIFIC AREA

N.M. Switucha*

Introduction

This paper analyzes the changing mineral production and trade patterns in the Pacific Area over the two decades ending in 1975. First it highlights the rapid postwar mineral production growth and trade expansion stimulated by rising demand for industrial raw materials in major industrialized countries. Second, it surveys significant developments in specific major mineral and metal commodities in the Pacific Rim countries and explores some of the issues and problems that have important implications on the future outlook for all major mineral commodities

The focus of the present paper is on the Pacific countries of Japan, Korea, the Philippines, Indonesia, Malaysia, Thailand, Singapore, Papua New Guinea, Australia and New Zealand. On the American continent Canada, United States, Mexico, Peru, and Chile are important Pacific Rim producers and consumers of major metal and mineral commodities, although a significant part of their mineral trade is directed elsewhere. Since the role of other countries in mineral production and trade is marginal, they are mentioned only as required. Study of the significance of the Socialist Block countries of Asia in the Pacific Area mineral trade is outside the scope of the present paper. Nevertheless, brief references to the USSR and China will be found in the text as necessary.

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Discussion will be limited to fifteen metals and minerals produced and traded in the Pacific Rim that are of major economic significance. These include the main non-ferrous metals of aluminum, copper, lead, zinc, nickel, titanium and tin, as well as iron ore, steel and coal. Other minerals and metals, such as rutile, zircon, tungsten, chromium, and their ferroalloys, are covered together at the end. Detailed data on production and trade in the major minerals are provided in the Statistical Appendix in these Proceedings, and references are made to them here as appropriate.

1. Minerals in the Economies of the Pacific Rim

World mineral production has more than trebled in volume in the past twenty years and a strong trend towards greater international trade in minerals brought about a growing interdependence between countries endowed with substantial mineral domain and the resource-deficient nations. A major share of this growth in mineral production and trade took place in the Pacific Rim, including both resource-rich and resource-poor countries.

This interdependence has become stronger owing to several peculiar characteristics of the mineral industry: the need for increasingly large capital expenditures in exploration and exploitation of mineral resources; increasing dependence on complex and advanced technology in discovering, mining, processing and transporting minerals; and the growing necessity of combining advanced management, technological and marketing skills in all stages of mineral exploration, development and trade.

Some countries, such as Canada, the United States and Australia have been characterized by a relatively abundant supply of a variety of mineral resources. In others, economic development depended to a large degree on the production and export of one or a few mineral commodities. Still others, such as Japan, less fortunate in terms of mineral endowment, succeeded in making major strides in economic growth based on the processing of minerals and metals into exportable industrial and consumer products.

Japan

Japanese demand for mineral resources in the postwar period increased at the highest annual rate in the world. During the decade between 1960-70, Japan's crude steel production grew 15.5 percent annually, while steel exports expanded at a 23.1-percent annual rate. Japan's demand for copper rose 11 percent annually, nickel consumption 15.7 percent annually and aluminum production 18.5 percent annually during the same period.⁽¹⁾

The average rate of increase in the demand for most resources exceeded the average growth rate of real GNP for 1960-1970. The share of mineral resources in Japan's annual imports increased from 38.7 percent in 1960 to 44.3 percent in 1970. In specific metal commodities the degree of dependence increased rapidly between 1960 and 1970, rising from 36 percent to 78.5 percent in coking coal, from 68 to 88 percent in iron ore and from 50 to 75.6 percent in copper.⁽²⁾ Most of these rose to over 90 percent by 1975. Import dependence in aluminum (including bauxite and aluminum metal), nickel, tin, and most other metals and minerals has always been 100 percent.

Processing raw material imports in Japan provided a base for high economic growth and for re-export of higher processed products. Direct export of metals in 1960 accounted for 14 percent of Japan's total exports, increasing to 22.5 percent by 1975. Indirect exports, in the form of finished industrial and consumer products were, of course, considerably higher.

Growing concern over energy conservation, industrial pollution and increasing opposition to land and water resource use for heavy industry in the early 1970's brought pressure for a shift in industrial structure (discussed in the paper in these Proceedings by Murota). Implementation of new policies, however, has been slow to evolve. The Japanese economy is likely to continue to require the importation of huge quantities of raw materials in crude form, and any change in this pattern will be a gradual process.

United States

Although the degree of mineral self-sufficiency in the United States has been relatively high, on average, various economic and social factors dictated substantial dependence on imports, especially for such important commodities as nickel, cobalt, bauxite, zinc, chromium, manganese and others. The degree of dependence on imports, while relatively modest by comparison with the EEC and Japan, has reached a substantial percentage of U.S. apparent consumption and has become a subject of increasing concern in both economic and strategic terms.

Between 1960 and 1974, the degree of the United States import dependence rose from 88 to 92 percent for nickel, 66 to 99 percent for cobalt, 75 to 98 percent for rutile, 89 to 98 percent for manganese and 46 to 60 percent for zinc. However, excluding mineral fuels, some 85 percent of the dollar value of raw and processed mineral origin materials consumed in the U.S. in 1976 originated from U.S. domestic sources.

The U.S. mining and minerals policy, as expressed in the Mining and Minerals Policy Act of 1970, defines the goal as availability of desired mineral materials at the lowest possible private and social cost, including environmental considerations. Minimizing government intervention in the market place, even at the cost of greater import dependence, is regarded as a desirable objective provided that security of supply considerations are not involved. Strategic security of supply was at the root of the U.S. decision to establish and maintain a minerals and metals stockpile to support military requirements and to insure reasonable functioning of the national economy in the event of extended conflict. The present value of all materials in the U.S. stockpile is estimated at \$7.5 billion.

The threat of producer cartels disrupting mineral supply and interfering with market forces encouraged the U.S. government to consider the implementation of an additional economic stockpile program. Implications of such policy for the free functioning of the marketplace and for the producing countries require very careful consideration of all aspects before a decision can be reached.

Canada

Canada's role as one of the world's leading mineral producers expanded rapidly in the 1960's. The mining production index (1971 = 100) stood at 118.2 in 1974, more than double the level in 1961 (54.7). The value of mineral production, exclusive of fuels, rose from \$1.9 billion in 1960 to \$6.5 billion in 1974. Crude and fabricated minerals accounted for 35.6 percent of the total 1974 export value of \$31.4 billion, up from 32.6 percent of the much lower 1965 export value of \$8.5 billion.

The pattern of Canadian mineral trade has remained relatively stable. In 1966 the U.S. took 60 percent of all Canadian mineral exports and Japan 4.6 percent. In 1974 the U.S. share increased to 68 percent of the total, and Japan's share to 9.1 percent.

In recent years, Canadian mineral policy has gradually shifted away from the wide open natural resource development and export policy generally followed in the past. Minerals are increasingly viewed as the key to enhance diversification and growth of the national and regional economies by increasing the degree of mineral processing and mineral-based manufacturing prior to export.

Australia

Although mining had been associated with Australian economic development since early colonial days, its full potential was not realized until the 1950's when discoveries of bauxite, nickel, rutile, iron ore and coal opened up a new era.

In 1974, the index of mineral production in Australia (1969 = 100) stood at 197.7, almost a five-fold increase from the level of 40.5 in 1960. The index of primary mineral products exports (1969 = 100), measured in constant prices, recorded an even more impressive rise from 17.9 in 1960 to 209.1 in 1974.⁽⁴⁾ The share of Australian mineral and metal exports in the country's total exports rose from 8 percent in 1964 to over 37 percent in 1974. The growing role of minerals in the Australian economy and the various policy issues involved are set forth in the paper by Ben Smith in these Proceedings.

Developing Countries

Most developing countries considered in this paper have experienced political independence for more than a quarter century, long enough to experiment with a variety of economic policies designed to obtain maximum benefit from their mineral wealth. Some of them have expressed their disillusionment with continuous economic dependence on the industrialized countries in the form of takeover or nationalization of primary mineral industries. Others have gradually introduced tighter controls on mineral exploration and development designed to foster increased local or state ownership.

Such policies, and particularly the terms under which acquisitions of mining company assets have been made in some countries, have been a principal deterrent to new investment in mineral exploration and production. An estimated 80 percent of the world-wide exploration expenditures in the 1970's have been made in the developed resource-rich countries -- Australia, Canada, the United States, and South Africa -- rather than in the developing countries.

The ambitions of the developing countries to increase domestic benefits associated with mineral production and trade also have been reflected in the formation of intergovernmental mineral producers' groups attempting to influence market decisions. The only mineral producing developing countries in the Pacific Rim that have not become members of some mineral producers' group are South Korea and Taiwan.

Southeast Asia

The five ASEAN countries of Southeast Asia have diverse economies and (except for Singapore) certain similarities in terms of mineral endowment. Malaysia, Thailand and Indonesia are important producers of tin; the Philippines and Indonesia are growing producers of copper and nickel. Malaysia and Indonesia share interests in the mining of bauxite.

The contribution of the mining sector to the Malaysian economy is small and in recent years has declined due to lower output of tin, bauxite and iron ore. Mining accounted for 4.0 percent of GDP in 1975, down from 5.7 percent in 1970. The export value of tin, \$1.2 billion

in 1975, amounted to 13.4 percent of total export receipts.

Non-fuel minerals in Indonesian economic development have always been overshadowed by the importance of oil and natural gas, exports of which provided 73 percent of gross foreign exchange earnings in fiscal year 1975. However, oil exploration and production activities also led to discovery of other valuable mineral resources including tin, bauxite, nickel, and copper as well as other less significant deposits of other minerals.

Most minerals in Indonesia are designated as either "strategic" or "vital" and their mining and processing can only be undertaken by the state or on behalf of the government. The government usually permits foreign private capital participation only under contract limiting the life of a mining company's investment permit, requiring maximum possible domestic processing before export and a gradual transfer of a portion of equity to Indonesians. Desiring to obtain the maximum possible return from mineral exports, the Indonesian government also has joined the International Tin Agreement (ITA), CIPEC and the International Bauxite Association (IBA).

In the Philippines, extensive reserves of copper ores have played a major role in recent economic development, but the Philippines are also an important producer of manganese, chromite, mercury and a growing producer of nickel. Mining of gold, silver, iron ore, lead and various non-metallic minerals takes place on a lesser scale.

Foreign investment in the Philippines, although closely controlled through foreign exchange and other regulations and constitutional limitations, has played an important role in stimulating mineral development and trade. A notable feature is the fact that the bulk of the country's minerals is still exported in an unprocessed state. Stimulated by various recent government measures, the prevailing trade pattern ought to shift increasingly towards mineral exports in more advanced stages of processing.

South Pacific

Although the mineral endowment of the newly independent Papua New Guinea is not yet well known, this mountainous country of some 600

islands is already a significant Pacific producer of copper, with gold and silver as by-products. Developed by Rio Tinto Zinc through the original agreement with Australia, the Bougainville island mine was largely responsible for Papua New Guinea's vital mineral export revenue. The original agreement was renegotiated in 1976 to provide higher government revenue, setting a pattern that is likely to be followed in negotiations on the future development of copper reserves on other islands.

New Caledonia's important nickel deposits have been at the root of the French government's reluctance to allow it a greater measure of self-rule, with the control of mining and taxation policies remaining in Paris. Some 25 percent of the world's land-based nickel reserves are located in New Caledonia, and it is the second largest nickel producer. New legislation, approved in 1975, provides for 51 percent New Caledonian ownership of new mining projects, but removes some of the obstacles to participation by foreign corporations.

New Zealand has never been a significant mineral producer, but it is an exporter of iron sands, coal and gold and minor amounts of some metallic ores. Its present policies are unlikely to stimulate exploration and development of mineral resources except to the extent necessary to make the country less dependent on foreign imports.

Latin America

All major mineral producing Latin American countries considered in this study underwent major changes in their policies toward mineral development in the past 10-15 years, affecting foreign investment and control of mining and mineral processing operations. Some of these changes were accompanied by drastic curtailment of long-established investment by multinational corporations, precipitating major structural dislocations within the industry and affecting regional trade patterns.

In Mexico, the process of acquisition of majority (51 percent) ownership, in accordance with the Mining Law of 1961, was accelerated by granting tax concessions to mining enterprises employing Mexican capital and by direct participation of the state in mining ventures.

For certain minerals, such as coal, iron ore and sulphur, local capital participation must be 66 percent. The Mexican government has consistently followed a policy of encouraging further processing of mineral resources before export to provide increased employment opportunities for the labor force.

Peru has strongly favored state involvement in all significant mining and processing ventures since 1968. All major mining concessions that were controlled by foreign (mainly United States) capital reverted back to the government and the state assumed exclusive rights to intervene directly in the minerals market. Joint ventures with foreign mining companies are discouraged, although such ventures may be approved by the Ministry of Energy and Mines if foreign partners contribute technology not otherwise available in the country.

Peru, together with Chile, Zaire and Zambia, is a founding member of the Intergovernmental Council of Copper Exporting Countries (CIPEC) and more recently has become a member of the Association of Iron Ore Exporting Countries (AIEC), the Primary Tungsten Association (PTA) and Association of Silver Exporting Countries.

In Chile, significant structural changes have taken place since 1966 which substantially increased the degree of governmental control and ownership of the mining industry. These developments and their implications are covered in the paper by Ernesto Tironi included in these Proceedings. Copper is the dominant mineral, but Chile also produces and exports significant quantities of molybdenum, found as a by-product of copper mining. Of some ten million tons of iron ore mined annually about 90 percent is exported to Japan and Europe.

2. Copper in the Pacific Rim

Pacific Rim countries are important producers of copper: their share in world mine production of copper was 50 percent in 1975 (56 percent in 1955) while their share of refined copper production was about 44 percent in 1975 (55 percent in 1955). The Pacific Rim includes some of the world's largest producers of copper in various forms: Canada, the United States, Chile, Peru, Australia, Japan and

the Philippines. Smaller producers are Korea, Indonesia, and Papua New Guinea (PNG).

In most cases copper has assumed significant or even critical importance in the economies of these countries. In the case of Chile, for example, the value of copper exports in 1974 accounted for 66 percent of total exports while in the case of Peru, 1974 copper exports were about 23 percent of the total.⁽⁵⁾ Copper concentrate exports from British Columbia in recent years represented the largest single export item in Canada's trade with Japan and in the case of Papua New Guinea, copper produced on Bougainville Island provides a very substantial proportion of government revenues.

Reserves and Resources

Pacific Rim countries are presently estimated to have some 57 percent of known world reserves (460 million tons*)⁽⁶⁾ although probable and hypothetical deposits are believed to be at least four times larger than known reserves. Canada and the United States account for 25 percent of the total, Chile and Peru for about an equal percentage. At least 25 million tons are in the Philippines, Papua New Guinea and Indonesia, while Australia is estimated to have at least 7.6 million tons.

Mine Production

Over the 20-year period 1955-75, world copper mine production increased at an average annual rate of 4.3 percent as shown in Statistical Appendix Table A-1. Some Pacific countries experienced substantially higher growth rates, averaging 13 percent in the Philippines and 7 percent in Australia and Peru. Canadian output rose at 4 percent annually, while that of the United States at only 2 percent. Papua New Guinea and Indonesia entered the supply picture only in the 1970's.

A significant feature of world copper mine production over the past 20 years has been a decline in the relative importance of the developed countries from 46 percent of the total in 1955 to 36 percent in 1975 and a rise of the relative share of the socialist countries of

Eastern Europe. The share of the developing countries has remained almost constant at about 41 percent. (Statistical Appendix Table A-1.)

In 1955 only 6.3 percent of the total 3.1-million tons mined were exported as ores and concentrates, while by 1974 this figure became 15.7 percent of a 7.65-million total. In 1975 four major concentrate exporting countries -- Canada, Chile, Philippines and Papua New Guinea -- accounted for 72 percent of the total tonnage traded as concentrates. Statistical Appendix Tables A-2 and A-3 present copper ore and concentrate trade statistics for 1965 and 1975 respectively.

The most significant market for copper concentrates in 1955 was the United States, but by 1965 Japan imported 60 percent of all copper traded as concentrates, and by 1975 Japan's imports had risen to 70 percent of the total tonnage traded. Canada and the Philippines accounted for 58.4 percent of Japan's concentrate imports, with most of the balance from Papua New Guinea, Indonesia, Chile and Australia.

Pacific Rim countries such as Papua New Guinea, Indonesia and Chile shipped modest tonnages of copper concentrates to EEC countries in 1975, while Philippine producers and the Western Canadian mines were largely dependent on the Japanese market. The extent of the British Columbia producers' dependency on the Japanese smelters is evident from Statistical Appendix Table A-4.

The ability of established Japanese smelters to offer competitive smelting charges and to compete aggressively for long-term supplies from new mine sources effectively discouraged smelter construction in other Pacific Rim copper-producing countries. Long-term concentrate sales agreements often provided to new mining ventures advantages of reduced risk and assured access to markets. While freight charges are an important consideration, concentrates have been transported in bulk from South America to Europe or from Papua New Guinea and British Columbia to Japan with costs per ton of metal content that are economically competitive with refined metal shipments.

International trade in copper concentrates was also encouraged by prevailing tariff structures which imposed an unacceptable penalty on blister and refined copper entering international trade. Other factors inhibiting local smelting and refining relate to limited local

market demand, environmental considerations and the need to dispose of sulphur produced as a by-product in flash-smelting.

Motivated by their desire for increased domestic investment, other Pacific Rim countries such as South Korea, Indonesia and P.N.G. may also move into copper smelting and refining as a step towards production of copper wire, cable and brass mill products. Considering current high capital investment costs and low copper prices, the economic success of such ventures is questionable without reasonably assured markets for blister and refined metal in the developed countries.

Refined Copper Production

While world-wide refined copper production grew at an average annual rate of 4.0 percent between 1955 and 1975 the annual growth rate in Japan averaged 10.4 percent (Statistical Appendix Table A-5). Japan became the third largest producer of refined copper in the world after the U.S.A. and the U.S.S.R. Among the Pacific Rim countries, only Australia's copper refining industry had a consistently high growth rate, averaging 8.3 percent annually, but in absolute terms Australia's production remains low.

In the U.S. and Canada, refined copper production increased over the 20-year period at lower rates than the world average. This reflects a more advanced level of economic maturity, a recognition by the industry of the relatively low profitability of smelting and refining, and the growing competition from "custom" smelters in Japan and in Europe. Another important factor was competition from aluminum, especially in the electrical conductor markets.

However, the most significant factor inhibiting increased refined metal production in Western Canada and Australia was the Japanese tariff system under which concentrate imports were allowed duty free while copper metal and semi-fabricated products were subject to escalating tariff rates. This situation was reinforced by the Japanese General System of Preferences (GSP) which provides for duty-free entry of metal from developing countries, such as Chile and Peru, but not from Canada or Australia. Also, the Japanese "sliding scale" tariff

system, related inversely to the current market demand for copper, provided effective protection for domestic producers when copper metal prices were low and relieved copper consumers of the tariff barriers when metal prices were high.

Escalating energy costs and increasingly stringent domestic environmental regulations may lead Japan to be more favorably inclined towards importing refined copper. Japanese industrial policy shows signs of becoming more sensitive to the aspirations of resource-exporting countries, a trend that is likely to encourage Japanese participation in joint venture projects in copper smelting and refining in copper-producing Pacific Rim countries.

Consumption Patterns

Statistical Appendix Table A-6 summarizes copper consumption patterns over the decade from 1965 to 1975 in the five major consuming countries or regions -- the EEC, United States, Canada, Japan, and Australia. It highlights the significant role of secondary refined copper in the industrial economies and shows a substantial change in Japan's import dependence. Japan's high industrial growth rate was instrumental in sustaining the world copper market in the last decade. But even in Japan, copper consumption growth lagged behind industrial production growth. There is also a significant difference in the Japanese copper consumption pattern in secondary manufacturing with over 55 percent of copper used in the wire and cable industry and only 12 percent in the manufacture of flat-rolled products (plate, sheet, strip) and pipe and tubes. The corresponding ratios were 53.4 percent and 34 percent respectively for Canada, and 47 percent and 20.4 percent for the United States.

As world-wide industrial activity slowed in 1974-75, copper consumption fell rapidly and refined copper inventories reached unprecedented levels. Consumption of refined copper in the developed countries fell from a peak of 6.43 million tons in 1973 to an estimated 4.9 million tons in 1975.⁽⁷⁾ The influence of high copper stocks has kept prices at unrealistically low levels, threatening the economic viability of copper mining ventures on the one hand and of the smelting

and refining firms on the other. Unexpected shortfalls in export earnings of such countries as Chile, Peru, and P.N.G. have had important implications for their balance of payments and economic well-being. Custom smelters in the developed countries were also under severe pressure to maintain imports of copper concentrates on the level contracted for under long-term agreements.

International Consultations

Motivated by common concerns over their high dependence on exports of copper, four developing countries formed an organization of copper-exporting countries in 1967 in an attempt to coordinate policies in world markets. CIPEC* strives for greater stability of copper demand and for stabilized copper prices. It now includes Chile, Peru, Indonesia, Zaire and Zambia, as well as Australia and P.N.G. as associate members.

CIPEC's concern with copper has now been taken up within a broader framework of the UNCTAD IV resolution on an Integrated Program for Commodities. This resolution included copper among 18 commodities that were to be subject to an integrated program, including the establishment of a common fund to help in financing internationally coordinated national stocks or a common buffer stock. No agreement has been reached yet on the modalities of the program or on a common fund concept mainly because of substantially different interests among the developed and the developing countries.

Future Outlook

The short-term outlook for copper is conditioned by high worldwide inventories, low prices and overcapacity both at the mining and at the smelting and refining stages. However, the risk of long-term oversupply is minimal as low copper prices have already deterred significant planned copper developments. Inflation has doubled the cost of installing new copper capacity in the last four years. Substantially higher copper prices will be necessary to attract invest-

*Conseil Intergouvernemental des Pays Exportateurs de Cuivre

ment capital to some of the lower grade deposits found in British Columbia, Australia and the Philippines.

World copper consumption will continue to grow with expanding industrialization and population growth. Developing Asian countries and the South American countries are likely to experience above average growth rates in copper consumption. Industrially developed countries, while experiencing lower growth rates, will continue to be by far the most important consumers of copper.

Major additions to smelting and refining capacity in the 1980's are likely to take place in the Philippines, P.N.G., and British Columbia, rather than in Japan or other importing countries. International trade in copper concentrates appears to have peaked and will gradually diminish in favor of trade in refined metal. However, the life expectancy of existing custom smelters in Japan and in Europe provides assured requirements for concentrate feed for the balance of this century.

As the pace of worldwide industrial activity gathers momentum, copper prices are likely to rise in real terms to the levels necessary to sustain and increase mine and smelter output and to provide a competitive return on investment. Pacific Rim countries are likely to attract a large proportion of future investments because of their attractive resource base and their economic and political stability relative to other copper-producing regions such as the countries of central Africa. Centrally planned economies will play a growing role in copper trade in Europe but are unlikely to shape the trading patterns in the Pacific Rim.

3. Lead and Zinc in the Pacific Rim

Six of the Pacific countries have been important world producers of both lead and zinc for many years and are likely to retain this role for the balance of this century. The United States, Canada, Mexico, Peru, Japan and Australia accounted for 68 percent of western world lead mine production in 1974 and for 52 percent of refined lead production. The corresponding figures for zinc were 68 percent of mine

production and 51.5 percent of refined zinc.

Four of the six countries -- Canada, Mexico, Peru and Australia -- are also major exporters of lead and zinc concentrates and refined metal. The United States and Japan supplement their domestic mine production with imports of ores, concentrates, and refined metal.

The most recent estimates of economically recoverable lead and zinc reserves⁽⁶⁾ in the five Pacific Rim countries are as follows:

	<u>Lead</u>	<u>Zinc</u>
	(millions of tons)	
United States	53.5	27.2
Australia	16.3	11.8
Canada	11.8	33.6
Mexico	4.5	3.1
Peru	3.6	8.6
World Total	145	158.7

Estimated additional lead and zinc resources worldwide are at least 1.5 billion tons of lead and 2 billion tons of zinc, of which at least one half is located in the five countries listed.

Production

As illustrated in Statistical Appendix Tables A-7 and A-8, lead mine output in the resource surplus countries has always exceeded refined metal production, while in the U.S. and Japan the reverse situation prevailed. In Canada, Australia and Peru, mine output has not only exceeded refinery output, but the percentage of output refined has been declining. On the other hand, in Japan the ratio of refined lead production to mine production increased drastically from 2:1 in 1965 to 3.8:1 in 1975. The corresponding figures for the U.S. were 1.5:1 and 1 3:1

In the case of zinc, as illustrated by comparing Statistical Appendix Tables A-9 and A-10, Canadian smelter production accounted for 64 percent of the mined tonnage in 1960 and only 35.7 percent in 1975. Australia increased its share of zinc smelted from 37 percent in 1960 to 62 percent in 1974. The corresponding figures for Peru were 20 percent in 1960, and 16.6 percent in 1975.

At the same time, United States slab zinc production was twice its mine production in 1960, but only 0.95 times in 1975. While mine production declined somewhat since 1965, smelter production fell from a peak of one million tons in 1969 to less than 450,000 tons in 1975. The industry became more dependent on imports of refined zinc metal and on increased secondary zinc recovery.

The pattern in Japan was distinctly different. The ratio of slab zinc to mine production rose rapidly from 1.1:1 in 1960 to 3.5:1 in 1974. A decline to 2.7:1 in 1975 was due to a low smelter operating rate while domestic mines continued to operate at full capacity.

Trade in Zinc

Canada, Australia, Mexico Peru and Japan are significant exporters of slab zinc as illustrated in Statistical Appendix Table A-11. Canadian exports are by far the largest, followed by Australia. Japan's exports are subject to substantial fluctuations depending on the domestic demand. By destination, Japanese slab zinc exports, as shown in Statistical Appendix Table A-12, have favored the U.S., South Korea and India. At the same time, Japanese slab zinc imports from Canada and Australia were replaced by North Korea.

Australian slab zinc is sold mostly in other Pacific Rim countries, including the U.S.A., New Zealand, Thailand, Taiwan and as far as India, with exports to U.K accounting for 15-20 percent of the total. In Canada's case, as shown in Statistical Appendix Table A-13, the United States and U.K. are by far the largest customers for slab zinc, while Japan takes about 20-25 percent of concentrate exports.

The pattern of Japanese zinc concentrate imports favors maximum possible diversification of supply sources with Peru and Canada competing for the first place and Australia, Mexico, South Korea and

Iran following. The Canadian share of the Japanese market has tended to rise somewhat in the 1970's reaching 39 percent in 1975, with Peru at 27 percent and Australia well behind at 14 percent.

Declining smelter production in the United States combined with growing consumption gave rise to a steady growth of zinc metal imports. In 1975 slab zinc imports accounted for 41 percent of apparent consumption. Canada was by far the largest supplier at 47.8 percent of the total, with Australia, Mexico and Peru contributing only 5-7 percent each and other countries sharing the balance.

Trade in Lead

A major feature of the lead trade pattern in the 1960's was the steadily growing volume of lead concentrate imports by Japan, largely from Canada (65 percent), Peru (15 percent) and Australia (10 percent). U.S. imports of lead concentrates also originated in Canada (17.6 percent), Peru (23 percent), and Australia (21 percent).

Another significant feature in the 1960's and early 1970's was the production of Australian lead bullion for export to Europe with the U.K. taking about 84 percent of the total. In recent years the volume of Australian lead bullion exported exceeded that of refined metal (Statistical Appendix Tables A-14 and A-15), and both were much larger than lead concentrates.

By comparison, Canada exports substantially more lead in concentrates than as refined metal, with the disparity increasing rapidly in recent years (Statistical Appendix Table A-14). Canadian lead concentrates are shipped generally to markets that are different from those taking Canadian refined lead (Statistical Appendix Table A-15).

A comparison of lead exports by the major Pacific Rim producers suggests that over the past 15 years there has been little, if any, growth in the volume of lead metal traded. Canadian refined lead exports actually peaked in 1970, Australian in 1962, Peruvian in 1964 and Mexican in 1961. The United States and Western Europe remain the largest markets for refined lead, while Japan dominates the market for concentrates.

Future Outlook

The capacity of traditional producers of lead and zinc to meet future demand is generally regarded as very good, with Canada, Australia and the United States having large undeveloped reserves that are waiting to be brought into production when economic conditions warrant. Increased environmental and land use concerns in Japan appear to impose serious constraints on any future expansion of domestic smelting and refining capacity and are likely to encourage joint ventures elsewhere to secure access to needed supplies.

In Canada, future mining developments are likely to center in British Columbia and the Yukon Territory where large lead-zinc deposits are located. The establishment of a lead and zinc smelter and refinery in Western Canada in the early 1980's is a distinct possibility, but the present flow of concentrates to Japan will continue as long as the existing Japanese smelters remain operational.

In Australia, several new attractive lead and zinc deposits are either being developed or are in the feasibility assessment stage. Some of them average as high as 34.5 to 41.8 percent zinc,⁽⁸⁾ offering an attractive economic incentive for early development.

4. Aluminum in the Pacific Rim

The dominant features of the aluminum industry in the Pacific are the concentration of bauxite production in Australia, a rapidly growing traffic in alumina derived from Australian bauxite and the importance of the U.S., Japan and Canada as producers of primary aluminum metal. Another important characteristic is the degree of vertical integration, with major transnational corporations playing a key role in the mining of bauxite, production of alumina, smelting of primary metal, provision of electric power and, to a certain degree, in the fabrication and distribution of aluminum products. This factor is less pronounced in Japan than in North America and Australia.

Large capital costs in the aluminum smelting process were a major factor in the location of the industry in developed countries, but this will change gradually as the availability of low cost hydroelectric

power becomes a major consideration. However, because of long lead times required to build new facilities on greenfield sites and the need for major capital investments, the pace of change will be relatively slow and gradual.

Bauxite Mining

World bauxite reserves, while varying widely in quality, size and accessibility, have been estimated in 1976 at some 24 billion tons.⁽⁶⁾ almost four times the 1965 estimate of 6 billion tons and almost eight times the estimate of 3 billion tons that was generally accepted in 1955. Australia is estimated to have at least 25 percent of world bauxite reserves, with Guinea having about an equal proportion. Caribbean and South American countries, mainly Jamaica, Surinam, Guyana and Brazil account for another one-fourth. Limited reserves are also located in other Pacific Rim countries such as Indonesia and Malaysia.

Australia has experienced a dramatic growth in bauxite production since 1966 to become, in about four years, the world's largest producer at 25 percent of world output. As illustrated in Statistical Appendix Table A-16, Australian bauxite production more than doubled between 1966 and 1968 and almost doubled again between 1968 and 1970. By 1974 it reached over 20 million tons of bauxite, or some 10.5 million tons of contained alumina⁽⁴⁾

Japanese and U.S. demand in the late 1960's and early 1970's stimulated a rapid rise in Australian alumina production, reaching 4.9 million tons by 1974. Domestic production of primary aluminum experienced only a modest rise, as shown in Statistical Appendix Table A-16, despite a doubling of Australian per capita consumption (Statistical Appendix Table A-19). Nevertheless, Australian exports of primary aluminum almost quadrupled between 1965 and 1972 reaching 99,400 tons.

Bauxite production in other Pacific Rim countries, while far lower than that of Australia, is of some economic significance, mainly in Indonesia and Malaysia. Their production levels and the rapidly rising world total, are shown in Statistical Appendix Table A-17.

Announced capacity additions in Australia are likely to double present volume by 1985. Other production expansions are likely to take place in Indonesia and of course outside the Pacific area in the Caribbean and South America.

In Indonesia, P.T. Alcoa Minerals, a subsidiary of the Aluminum Co. of America, identified significant bauxite reserves in West Kalimantan and has proposed an alumina refinery to process over 2 million tons of bauxite annually for a target output of 800,000 tons of alumina.

While Australia is a member of the International Bauxite Association (IBA), it is capable of exercising a moderating influence on other smaller members because of its market power as the largest bauxite producer and exporter. Australia, as well as most bauxite producing nations, is interested in increasing the proportion of bauxite processed to alumina before exports and in maximum utilization of the already installed alumina capacity. The operating rate of the Australian alumina refining plants had been rather low in recent years, averaging about two-thirds of capacity versus about 90 percent in the U.S. and over 80 percent in Japan.

Australia's future policies are likely to favour holding down bauxite price increases to avoid potential competition from alternative raw materials while encouraging investment in alumina refining at the mine site.

Primary Aluminum

During the decade of 1965-1975, world primary aluminum production increased over 90 percent, from 6.3 million tons in 1965 to 12.7 million tons in 1975 (Statistical Appendix Table A-20). Production peaked in 1974 at 13.81 million tons of which the United States and Canada together accounted for 5.47 million or 41.5 percent of the total. Japan contributed 8.5 percent while Australia and New Zealand together were responsible for 2.4 percent.

Japanese production almost quadrupled during 1965-1974 (Statistical Appendix Table A-18), reflecting a very rapid rise in domestic per

capita consumption from only 8.7 lbs in 1965 to 37.7 lbs in the peak consumption year of 1973 (Statistical Appendix Table A-19). Primary aluminum production could not keep up with the rising demand, necessitating a 1,131 percent increase in imports of primary metal over 1965-1974. While Japan exported some aluminum as ingot and additional quantities as mill products (Statistical Appendix A-18) such exports have never reached major proportions.

A relatively high ratio of primary metal imports relative to domestic consumption is a direct result of the structure of the Japanese aluminum industry and of the degree of foreign capital participation and control. It is estimated that about one half of annual ingot imports reflect foreign producers' (Alcan of Canada and Alcoa of U.S.A.) shipments to their subsidiaries and affiliates in Japan and the balance represents direct imports by independent fabricators and secondary aluminum producers.

The Japanese aluminum industry has always been characterized by a relatively high ingot cost, mainly because of unfavorable power costs. Since only very few domestic producers have the advantage of power supply from low-cost hydroelectric facilities, the industry was badly shaken by the quadrupling of oil prices in 1973-1974. Reflecting substantially decreased domestic demand and rapidly rising inventories, the average operating rate of Japanese aluminum smelters fell to as low as 64 percent of installed capacity by the end of 1975. (Statistical Appendix Table A-21).

In searching for ways to deal with this new situation, the Japanese industry has focused on corporate restructuring and closer integration of smelting, refining, rolling and processing operations. Increased emphasis is being placed on off-shore joint ventures in countries with undeveloped hydroelectric power resources where electric power costs are likely to remain relatively stable.

Future Outlook

To enhance the continuity and security of future primary aluminum supply, Japanese industry (with strong government encouragement)

recently entered into joint venture agreements in several countries to build aluminum smelters or to expand existing facilities, including projects in Canada, Venezuela, New Zealand, Indonesia, and Brazil. The Asahan project in Indonesia, scheduled for completion in 1982-84 and 90-percent financed by Japanese public and private funds, includes construction of hydroelectric power facilities and a 250 000-ton capacity smelter. Japan will import at least two-thirds of the smelter's output.

Another major aluminum smelting project being developed with Japanese financial and technical assistance is a joint venture with Brazil in the Amazon River delta which when completed in 1979-80, is scheduled to produce 320,000 tons of primary metal. The potential is excellent over the longer term for Brazil to become a major supplier of primary aluminum to Japan because the nation has large undeveloped bauxite reserves combined with large undeveloped hydroelectric potential near the main sources of bauxite. In the early 1980's, Brazil will become a significant exporter of primary aluminum (Statistical Appendix Table A-22) and, assuming further development of bauxite reserves, a supplier of bauxite and/or alumina to Japan and other countries.

Another potential source of primary aluminum for the Pacific Rim in the 1980's will be the Soviet Union, based on its huge underdeveloped hydroelectric power potential in Central and Eastern Siberia. Construction of the new Bykal-Amur railway will facilitate both shipments of bauxite or alumina westward from the Pacific coast ports and eventual export of aluminum metal to the Pacific Rim countries.

In summary, the outlook for the 1980's is for further growth of Australian bauxite production and of bauxite and/or alumina exports to the industrialized countries. This pattern will be supplemented increasingly by growing trade in primary aluminum as various projects now under construction or in the planning stages in the developing countries mature and reach the production stage. The important consideration in the future location of primary aluminum plants will be

the availability of uncommitted hydroelectric power capacity rather than proximity to raw materials or to the consuming markets.

5. Nickel in the Pacific Rim

As the world's largest producer of nickel for most of this century, Canada has played a dominant role in the nickel industry of the Pacific Rim for many years. However, the development of New Caledonia deposits in the 1950's and 1960's, the discovery and exploitation of Australian reserves in the late 1960's and the growing economic importance of nickel mining and processing industries in Indonesia and the Philippines have all tended to shift the focus of activity away from Canada.

Nevertheless, Canada's mine production of nickel in 1974 still accounted for 44.3 percent of the 607,000 tons of contained nickel mined in the western world (Statistical Appendix Table A-23), although this represents a significant decline from 69.5 percent in 1960. By comparison, New Caledonia accounted for 19.1 percent in 1960 and 22.2 percent in 1975. Australia, which started producing nickel only in 1967, accounted for 10 percent of western world production in 1975.

World nickel reserves, estimated at some 55 million tons of contained nickel⁽⁶⁾, are mostly in laterite deposits, rather than in the sulfides found in Canada. New Caledonian reserves account for about 25 percent of the world total, while Canada's share is estimated at 16 percent. Economically mineable reserves in other Pacific Rim countries, while considerable, are not yet accurately known and active exploration is continuing in Australia, Indonesia and the Philippines.

Nickel Smelting and Refining

A large proportion of Canadian concentrates (Statistical Appendix Table A-24) is smelted by Inco Ltd. or Falconbridge Nickel Mines Ltd. Inco exports nickel matte to its refinery in the United Kingdom while Falconbridge supplies its refinery in Norway. Also, Inco has equity interest in Shimura Kako, a Japanese producer of ferronickel and

refined nickel, and in Tokyo Nickel Co., a producer of nickel oxide. Shipments to these subsidiaries and affiliates explain the export patterns shown in Statistical Appendix Table A-25. The third Canadian nickel producer, Sherritt Gordon Mines, has a 10-percent interest in Marinduque Mining and Industrial Corp. in the Philippines and an 11-percent interest in P.T. Pacific Nikkel in Indonesia.

The beginning of nickel smelting and refining in Australia dates only to the early 1970's. Western Mining Corp., the operator of several mines and of a concentrator in Western Australia, is now operating a 65,000-ton-a-year capacity smelter and a 20,000-ton-a-year nickel refinery based on the Sherritt Gordon process. A new property, owned by Metal Exploration N.L. and Freeport Minerals Co., had been developed in 1974-75 to produce some 20,000 tons a year of 90-percent nickel oxide sinter and another project by British Selection Trust and MIM Holdings Ltd is under development. In the years ahead Australia is expected to continue increasing nickel mine and smelter production over present levels (Statistical Appendix Tables A-23 and A-24) reaching at least 75,000 tons by 1980. Development of other land-based operations in the Pacific area and the supply of nickel from sea-bed operations may cause deferment or abandonment of other Australian nickel projects beyond 1980.

About 40 percent of New Caledonian nickel ore is exported to Japan for processing into ferronickel while some 20 percent is processed locally to nickel matte and the balance to ferronickel. Both nickel matte and ferronickel are exported, mainly to France but also to Japan and the U.S.A. The volume of exports in recent years has been about 40-60,000 tons of concentrates, 20,000 tons of nickel matte and 35-45,000 tons of ferronickel.

Japan's demand for nickel (shown in Statistical Appendix Table A-27) has given rise to the establishment of a substantial smelting and refining capacity, rated at some 133,000 annual tons of nickel. Japan imports about 55 percent of its total nickel requirements as ores and concentrates from New Caledonia, Indonesia and Australia, 20-30 percent as matte from Canada and New Caledonia and the rest as refined

nickel from Canada, Norway, the Soviet Union and other countries.

Indonesian nickel production, as shown in Statistical Appendix Table A-23, had been minor until the early 1970's. The state-owned P.T. Aneka Tambang was the only producer, but its production now is being expanded to 25,000 tons annually. A new lateritic nickel project by P.T. International Nickel Indonesia (a wholly-owned subsidiary of Inco Ltd.) should provide an additional 45,000 tons a year of nickel contained in matte by 1978. Feasibility studies are underway on another project involving a consortium including U.S., Canadian and Dutch interests, which should raise Indonesia's nickel output to some 115,000 tons annually by the early 1980's and make the country the third largest nickel producer in the western world.

Nickel production in the Philippines was insignificant until 1974 when Marinduque Mining and Industrial Corp. started production on Nonoc Island employing the Sherritt Gordon hydrometallurgical process. The Rio Tuba Nickel Mining Company's laterite project will provide its Japanese partners with up to 500,000 tons of ore annually starting this year. A third project, by Atlas Consolidated Mining and Development, involving a mine concentrator and refinery, is likely to be completed in the early 1980's.

Future Outlook

Established supply patterns of the 1960's are undergoing a drastic change in the 1970's. No longer will the Canadian nickel industry be a dominant factor in the world market. The weight has clearly shifted (and will continue to shift) in the Pacific area to New Caledonia, Australia, Indonesia, the Philippines and Japan.

On the consumption side (Statistical Appendix Table A-27), the high annual growth rate of 6.8 percent prevailing from 1960 to 1974 is unlikely to continue over the longer term. The United States, Japan and Western Europe will remain the major consumers of nickel in all forms.

A new factor that is expected to enter the nickel supply-demand balance in the mid-1980's is the recovery of nickel from sea-bed

nodules. Canada, the U.S.A., Australia and Japan all are represented on the international industrial consortia that is engaged in research and development on the exploitation of sea-bed mineral resources. Assuming that an international agreement on sea-bed exploitation is reached at the Law of the Sea Conference and that the remaining technological difficulties are resolved in the next few years, sustained commercial production could begin by the mid-1980's. Further discussion of ocean mineral resources is provided in Gorham's paper in these Proceedings.

Indications are that nickel recovered from ocean nodules might be competitive with lateritic deposits. Under such conditions mining of sea-bed nodules will have a significant adverse effect on the Pacific Rim laterite producers such as Indonesia, the Philippines and Australia. The short-term outlook is for oversupply of nickel from land-based projects presently under development, and if sea-bed mining proves to be economic, these land-based sources would face increased competition, leading to lower relative price levels.

6. Tin in the Pacific Rim

More than 70 percent of current world mine production originates from the great tin fields of the Far East that start in Burma and run down through Thailand and Malaysia as far as the islands of Singkep, Bangka and Belitung in Indonesia. In the South Pacific, Australia produces significant quantities of tin while in South America, Bolivia is a major producer. Large tin deposits also have been identified recently in Brazil.

The Soviet Union ranks second among world producers of primary tin. Additional substantial tin resources are known to occur in China, which has been an important producer and exporter for several decades, although factual reserve and production data are not readily available.

The characteristic occurrence of tin in association with granitic rocks or in rock debris washed away by water is responsible for the

relatively small scale of most tin mining operations. Except for Bolivia, where practically all production is from underground mines, tin in the Pacific Rim countries is mined mostly from unconsolidated deposits by dredging or gravel pumping. Offshore dredging, especially off the Indonesian islands, also has become an important technique over the years.

Production

World mine production of tin-in-concentrates rose from 87,500 tons in 1945 to a peak of 172,900 tons in 1953. A significant decline in 1958 to 117,600 tons was followed by a long gradual rise to a record of 194,300 tons in 1972, followed again by a gradual decline. Production in selected years, shown in Statistical Appendix Table A-28, demonstrates both the relative roles of the major Pacific Rim producers and their combined contribution to the total world tin production. The changing relation between production and consumption is discussed further in Mohamed Ariff's paper in these Proceedings.

Malaysia

Malaysia has been a major producer of tin, contributing some 25 percent of world total production in 1948, 36 percent in 1955 and about 40 percent in the 1960's and early 1970's. The peak production of 76,830 tons reached in 1972 has been followed by a decline in output caused by a continuous increase in costs and generally inadequate tin prices, leading to a lack of profitability aggravated by the taxation burden. The industry is heavily fragmented with hundreds of small- and medium-size operators in addition to some larger, technically more advanced firms. Malaysian industry in 1975, for example, operated some 861 gravel pumps and 54 dredges, employing over 40,800 workers. The policy of the Malaysian government is to encourage the participation of the Malays and other indigenous people in the mining sector by according them preferences in the granting of mining rights and by providing the required technical training. Out of over 960 operating units at the end of September 1975, 50 units were owned and operated by

Malay interests compared to only 26 units in 1970.⁽¹⁰⁾

The efforts of the Malaysian government agencies in prospecting and exploratory work have assured the maintenance of mineable reserves in the foreseeable future. Potentially economic undersea deposits lie off the western coast of Malaysia, and the prospects for their exploitation are regarded as good.

Thailand

Most of Thailand's tin production comes from the southern peninsular part of the country (which is a continuation of the Malaysian fields) and from offshore deposits. Tin-in-concentrates production, largely stagnant during the war, increased rapidly to some 10,500 tons by 1950 and reached a peak of 13,745 tons by 1957. After a temporary decline, production continued to expand after 1960, and in 1963 Thailand temporarily overtook Indonesia as the world's third largest producer.⁽¹¹⁾

While Thailand's potential for increased production over the present 20,000-ton level is considerable and her reserve position is substantial, economic considerations are likely to direct future additions to capacity towards other Southeast Asian countries.

Indonesia

Indonesian tin production levels fluctuated in the 1960's because of loss of both the technical and managerial skills of the former Dutch mining enterprises and skilled manual labor of the Chinese workers. The Indonesian tin reserve position is very promising both in the onshore and offshore category, although offshore operations now account for about 60 percent of annual production.

Production comes from the state-owned PN Tambang Timah as well as other private domestic and foreign firms. Domestic smelting is handled by Tambang Timah, and Indonesia has become self-sufficient in smelting facilities (up to 32,000 tons of tin metal). Tin export controls implemented by the International Tin Council and tin surpluses on world markets are likely to remain a major impediment to the expansion of Indonesian production.

Australia

Australia's share of world tin production has always been rather small, averaging between one and two percent until 1960, but increasing to 5.3 percent by 1975. Production tonnage peaked in 1972 at 11,997 tons of tin-in-concentrates and 7,027 tons of primary refined tin, declining thereafter due mainly to unsatisfactory profitability. The number of tin mining establishments declined from 107 in 1970-71 to 47 in 1973-74 and a further decline was anticipated in 1975-76.⁽¹²⁾

Associated Tin Smelters Pty Ltd. in N.S.W. is the only domestic Australian tin smelter, but the output of refined tin has been about half the rated capacity in recent years due to the low average grade of concentrates, limitations imposed by technical problems, shortages of feedstock and most recently, imposition of ITA export quotas. The Australian tin mining and smelting industry is unlikely to play a greater role in the future supply of tin in the Pacific Rim.

Soviet Union

Present Soviet domestic tin production, mostly originating in the Eastern Siberian and Far Eastern regions, is estimated at some 25,000 tons annually, up from some 15,000 tons in 1965. Irregular and rather insignificant until about 1959, Soviet tin imports gradually increased to 5,800 tons in 1965 and to almost 10,000 tons by 1975. Soviet tin imports in selected years (Statistical Appendix Table A-32) illustrate a growing dependence on Malaysia and a significant role for the U.K.

The significance of the socialist block countries as importers of tin from Southeast Asia is likely to grow as their economies become further developed and as growing demand for consumer products brings increased production of tin-plate. The Soviet Union (and other socialist block nations other than China) are active members of ITA.

China

Available information suggests that Chinese tin production can be expanded beyond the present annual level, estimated at some 20,000 tons of primary tin. The incentive for export earnings makes China a

potentially stronger competitor in the future.

After peaking at 7,480 tons in 1949, Chinese tin exports declined to zero in the early 1950's, but started rising again beginning in 1957 to reach 7,140 tons in 1963. A period of decline between 1964 and 1969 was followed again by accelerated exports in the 1970's, reaching 12,130 tons in 1975. (11)

Aided by an absence of tariff barriers in the U.S. market, exports of Chinese tin to the U.S. rose from zero in 1971 to 6,378 tons in 1975, causing concern among members of the International Tin Council (ITC) as Chinese exports are not controlled by the ITC export quotas.

International Tin Agreement

Since 1956, a series of international agreements called the International Tin Agreements (ITA) have intervened in the tin market through export quotas and a buffer stock to maintain agreed floor and ceiling prices. Mohamed Ariff's paper in these Proceedings explores the operation and influence of the ITA in detail.

Consumption

Because tin plate is the principal application for tin (more than 40 percent of total use), consumption of primary tin is heavily concentrated in the industrialized countries. As shown in Statistical Appendix Table A-29, the United States is by far the largest consumer, although tonnage consumed peaked in 1966 and has been declining since then due mainly to the adoption of new tin-saving technology and competition from other materials in the packaging industry.

Japan is the second largest consumer. Tin consumption reached a peak of 38,670 tons in 1973 and declined to 28,100 tons by 1975 due to a substantial decrease in steel production reflecting a general economic downturn. A comparison of tin consumption by end use in the three largest consuming countries (Japan, U.S.A., and U.K.) is shown in Statistical Appendix Table A-30 which also reflects the negative effects of the economic downturn in 1974-75 on the demand for tin in the industrial societies.

With tinplate production presently concentrated mostly in major industrial countries, as shown in Statistical Appendix Table A-31, there remains a large potential for further growth in tinplate production in the developing economies and in the socialist block. Expanded use of soldering alloys, bronzes and brasses should also contribute to an increase in tin demand. The overall growth pattern of the world economies suggests a slow but steady growth in demand.

Future Outlook

Measured, indicated and inferred reserves of tin in the Pacific Rim (including China) are estimated by the U.S. Geological Survey⁽¹³⁾ at 21 million tons or 54 percent of total estimated world reserves. World demand for primary tin by 1985 is estimated at only 284,000 tons. Based on historical consumption patterns, but allowing for the effects of substitution, the probable average annual growth rate between 1973 and 2000 is estimated to be 1.5 percent.

The Pacific Rim countries should remain the most important source of tin supply in the world in the foreseeable future. Developing countries will gradually absorb a greater proportion of the total supply, while the present importance of the U.S. and the Japanese markets will gradually decrease in relative terms.

7. Titanium Minerals in the Pacific Rim

Rutile is currently mined only in Australia while ilmenite is produced in Australia as well as in Canada, the United States, India, and Malaysia. Rutile contains about 97 percent pure titanium dioxide while ilmenite may contain a maximum of 53 percent titanium dioxide. While world reserves of ilmenite are considerable, those of rutile are rather limited and are likely to grow in economic significance as the demand for titanium metal and pigments expands.

As the only significant world producer of rutile, Australia has the power to control the supply and price of rutile, although the significance of synthetic rutile from ilmenite continues to grow. At

the same time, Australia is a major producer (and more recently the largest exporter) of ilmenite, although the average titanium dioxide content of Australian ilmenite (50 percent) is lower than Canadian titanium slag (70-72 percent titanium dioxide).

Reserves and Resources

World rutile reserves have been estimated⁽⁶⁾ at 37 million tons (excluding socialist block countries), of which Australia accounts for at least 9.7 million, India 13.8 million and Sierra Leone for 3.1 million tons. Total Australian rutile resources are at least equal to estimated reserves, but their mining is rather questionable because of growing environmental concerns. Substantial resources also exist in the U.S., Brazil and Mexico, but they cannot as yet be classified as economic reserves.

World ilmenite reserves, at some 770 million tons, are considerably more plentiful, with Australia's share (about 38 million tons) considerably lower than Canada's (200 million) or the United States' (83 million). Major ilmenite resources also have been identified in India, South Africa and the Scandinavian countries, diminishing the long-term economic dominance of the Australian and Canadian deposits.

Rutile and Ilmenite Production

Statistical Appendix Table A-33 shows the production pattern of titanium minerals in the Pacific Rim from 1960 to 1975. Until recently Australian rutile production was derived entirely as a co-product of zircon production from beach sands scattered along the eastern coast. Ilmenite production was confined to the beach sands of Western Australia with zircon as a by-product, but the development of huge deposits in the Eneabba area of Western Australia since 1974 will substantially increase supplies.

Canadian ilmenite is mined by Quebec Iron and Titanium Corp. by open pit methods in eastern Quebec. The deposit constitutes one of the world's largest, with reserves exceeding 100 million tons grading 35 percent titanium dioxide and 40 percent iron. A number of lower grade

deposits are in the Canadian Shield, which ultimately may be developed. Virtually all Canadian ilmenite is converted into titanium slag and exported to the U.S., Japan, and Europe for processing into titanium pigments.

While the U.S. share of world titanium ore output declined from 35 percent in 1965 to 18 percent in 1974, the United States consumed over 34 percent of world mine production during that period⁽¹⁴⁾--rutile from Australia and titanium slag mostly from Canada. Pigment manufacture accounted for about 92 percent of total consumption, with the remainder used in the production of titanium sponge, welding rod coatings, carbides, and in ceramic and glass formulations.

In Malaysia ilmenite is produced as a by-product of tin mining with about 75 percent of production exported to Japan. Other potential sources of titanium minerals in the Pacific Rim are in Indonesia and New Zealand.

In the absence of domestic production, Japan relies on ilmenite and rutile imports to feed growing titanium dioxide and titanium sponge industries. By 1974, Japanese imports of titanium ores and concentrates had risen to 680,000 tons (gross) of which 24 percent came from Australia, 24 percent from Canada, 24 percent from Malaysia, 15 percent from India, and 13 percent from Sri Lanka. Japanese titanium dioxide production capacity substantially exceeds domestic requirements with exports destined to pigment manufacturers in the U.S. and other world markets.

Titanium Metal

Significant fluctuation in the demand for titanium metal in the United States reflects its major use in the aircraft and aerospace industries. As shown in Statistical Appendix Table A-35, the U.S. industry is dependent on imports of sponge metal to supplement domestic needs. In addition to the U.S., there are only three other producers of sponge metal -- Japan, the U.K., and the U.S.S.R. Between one-third and one-half of the Japanese production is exported to the U.S. market and the balance is consumed domestically or exported to Europe.

Despite competition from advanced composite materials in aerospace applications and from stainless steel in industrial uses, the outlook for a continuing growth in demand for titanium sponge metal in the U.S., Japan and the EEC is good. Industrial applications in the chemical and metal processing industries will grow in relative importance. Titanium scrap recycling is likely to remain a major component of the metal supply cycle as illustrated in Statistical Appendix Table A-35.

Zircon Production and Trade

Of additional economic significance in the mining of titanium minerals in the Pacific Rim is the presence of the mineral zircon as a by-product. Australia now has the largest economically recoverable zircon reserves, estimated at some 14.3 million tons or 34 percent of total world reserves, followed by the United States with 28 percent. These two, plus India and Sri Lanka account for 30.7 million tons or 74 percent of the world total.

Mine production of zircon, as illustrated in Statistical Appendix Table A-36, is limited to Australia and the U.S. Australia's share of 86 percent in 1970 decreased to 74 percent by 1974 due to a rapid rise of U.S. production.

Japan and the U.S. have been consistently the largest importers of Australian zircon (Statistical Appendix Table A-34), although exports to the EEC countries have been significant. A decline in U.S. imports in 1974 was in response to a sharp increase in prices and growing availability of domestic supplies.

The use of zircon in foundries, refractories, ceramics and abrasives accounts for over 90 percent of total consumption. Japan has been a large user of zircon in refractories, while in the United States foundry applications account for over 50 percent of the total.

Future Outlook

The outlook for zircon production in Australia is bright, especially in the Eneabba area in Western Australia. However, new

supplies of zircon are expected to come on the market in the 1980's from South Africa, Brazil and Canada. In the longer term there could well be an oversupply of zircon on the world markets.

The outlook for rutile is for stronger competition from recently developed technological processes involving beneficiation of ilmenite to produce synthetic rutile. There are already four such producers in the Pacific area, in Australia, Japan, Taiwan, and India. However, the demand for pigment, welding rod and titanium sponge production is expected to be strong and any possible over-capacity is expected to be only temporary.

8. Iron Ore, Coal and Steel

Iron Ore

World iron ore production increased 46 percent (some 280 million tons) over the period 1965-74, reflecting the rapid growth of the iron and steel industry. The share of the major Pacific Rim producers has changed substantially mainly because of large scale iron ore developments in Australia, Canada and Brazil and a small decline in United States output.

Starting with a small production level of less than 7 million tons in 1965, Australia became the largest iron ore producer and exporter in the western world by 1974 (96 million tons). While the U.S. still holds second place in tonnage produced (86 million tons), it is likely to be overtaken by Brazil before the end of this decade. Canada now ranks fourth in production tonnage (48 million), exporting 77 percent of the total. The export ratios of the other major Pacific Rim producers, based on 1974 figures, are Australia 88 percent, Peru 96 percent, and Chile 88 percent.

Increases in world demand for iron ore have been somewhat slower than the rise in world steel production due to a gradual increase in the iron content of the ore entering international trade. The average iron content in 1974 was 58 percent, while in the 1950's it was 51 percent.

Another major factor influencing the demand for iron ore was

technological change in the iron and steel industry. Large scale change from open-hearth furnaces to the basic-oxygen method and the growing use of electric furnaces, as shown in Statistical Appendix Table A-41, have had the effect of increasing the demand for iron ore.

Other technological factors of considerable significance were the wide-scale introduction of beneficiation of lower grade iron ores and the gradual advent of direct reduction. Both have had the effect of increasing the demand for specific iron ore products and encouraging a more selective long-term contractual relationship between producers and consumers.

While direct shipping iron ores predominated in international trade in the 1950's, concentrates and agglomerates gradually became the most preferred form of iron ore shipments. This pattern is illustrated by the changing ratio of Canadian iron ore shipments with 68 percent of the tonnage shipped in 1955 being direct shipping ores while by 1974 the proportion had declined to about 14 percent. Over the same period, agglomerates such as pellets and sinter increased to 55 percent of the total and concentrates to 30 percent.⁽¹⁶⁾

In long distance iron ore transport, freight costs declined as bulk movement systems became more efficient. The average share of freight, as a percentage of Japan's c.i.f. iron ore import cost, stood at 33 percent in 1970 versus 41 percent in 1960. Competitiveness of Australian iron ore in Japan was significantly enhanced by a relatively low freight cost component of the total delivered cost. In 1970, for example, the freight cost of ore delivered to Japan averaged \$2.25 per ton from Australia, Brazilian \$4.90, Indian \$5.20 and Chilean \$5.70.⁽¹⁷⁾

Japan's iron ore imports, shown in Statistical Appendix Table A-37, have been instrumental in stimulating the development of large scale iron ore reserves in Australia and to a lesser degree in India, Chile and Brazil. Australia's share rose from less than one percent in 1965 to 48 percent of Japan's iron ore imports in 1975. Canadian iron ore is not competitive in the Japanese market, mainly because of the freight component, except for a limited tonnage mined on the West

Coast. Only about 11 percent of Canadian exports go to Japan.

United States import dependence increased in the 1970's, reaching about 40 percent of the 1975 apparent consumption of 114 million tons. However, current large scale expansion of the U.S. iron ore industry will assist in maintaining self sufficiency at about 65 to 70 percent in the 1980's.

North American iron ore prices are governed largely by a reference price established by the steel industry and do not necessarily reflect supply and demand balance since more than 85 percent of the iron ore traded comes from captive mines. In Japan, Australian ore has established price leadership while any ore shipped to the European markets must compete with Swedish supplies. North American base prices have been, on balance, higher than those prevailing in Japan and in Europe.

In the 1960's and early 1970's, iron ore was marketed in Japan on the basis of long-term fixed price contracts. Inflationary cost pressures and the growing bargaining leverage of iron ore exporting countries have now led to annual price renegotiations, with increases averaging about 14 percent in 1975.⁽¹⁸⁾

Japan's iron ore imports have dominated international iron ore trade in the Pacific Rim and are likely to continue doing so in the future. Brazil will offer strong competition in the future to Australia and Japan, and Canadian and U.S. ores will be gradually phased out.

As new steelmaking capacity is built in the developing countries of the Pacific Rim, iron ore trade patterns will gradually diversify with South Korea, Indonesia and Mexico becoming significant importers. At the same time all producers will attempt to diversify their markets in an effort to become less dependent on Japan as a consumer.

Repeated initiatives aimed at the formation of an iron ore producers group resulted in the Association of Iron Ore Exporting Countries, formally inaugurated in 1975. Its membership includes Algeria, Australia, Chile, India, Mauritania, Peru, Sweden, Tunisia and Venezuela. Canada and Brazil declined to join, limiting the Association to countries accounting for 48 percent of world iron ore exports, and limiting its impact on pricing or market shares.

Coal

Uneven distribution of world coal reserves, and higher grades of metallurgical coal in particular, is responsible for the concentration of coal mining in a very few countries (shown in Statistical Appendix Table A-38). Nearly 95 percent of the hard coal output of some 2,390 million tons annually is produced by ten countries. About 66 percent of the lignite and brown coal originates in three countries, while an estimated 95 percent of all world coal reserves are contained in the U.S.A., U.S.S.R., and the People's Republic of China (PRC). The result is an extensive international coal trade with six exporting countries accounting for 95 percent of all coal exports and Japan importing about one third of the tonnage entering international trade.

In the Pacific Rim the dominant producers of hard coal are the United States (26 percent of the world's total), the U.S.S.R. (22 percent), PRC (19.7 percent), and Australia (2.8 percent). For the purposes of this study only hard coal will be considered; except for some limited trade in soft coals between the U.S.A. and Canada practically all international trade in the Pacific Rim is in hard coal.

Pacific Rim trade in coal was dominated by rapid growth of the Japanese steel industry. Japan's intensive search for high quality coking coals strongly influenced the development of Australian and Western Canadian reserves and increased the dependence on low ash and low sulphur content U.S. coals. Imports increased rapidly from 6 million tons in 1960 to 46.7 million tons in 1970 and to almost 59 million tons by 1974.

The distribution of Japanese imports, as shown in Statistical Appendix Table A-39, was due in part to a desire for diversification of supply sources and in part to technological advantages derived from blending the most desirable coal grades in the production of blast furnace coke. The Japanese steel industry has perfected the technology of cokemaking in order to maximize blast furnace productivity and in the process became more dependent on the supply of high quality, low volatile coals from a limited number of sources.

The effect of the 1973 oil crisis was a conspicuous change in

energy policies worldwide reversing the shift away from coal. Increased recognition of coal's energy value, combined with continuing expansion of steel production worldwide, helped raise coal prices to levels almost four times higher than in the early 1970's. Japan's average c.i.f. cost of coking coal in December 1974 was \$60.50 per ton or 2.4 times the \$25.67 per ton in December 1973.⁽¹⁸⁾

The future outlook in Japan is for increased coking coal imports in the 1980's as the Japanese steel industry output recovers. The present import structure is likely to change in favor of higher imports from Canada and the U.S.S.R., reflecting long-term contractual commitments and development of new supply sources in Western Canada and in Eastern Siberia.

Pacific trade in coking coal will also gradually diversify as other countries -- mainly South Korea, Mexico, and Brazil -- expand their primary steelmaking capacities. Canada and Australia are already shipping small quantities to these markets.

In the 1980's, a limited trade in lower grades of thermal coal will also develop as Japanese electric utilities begin to implement diversification programs to lower their heavy dependence on crude oil. However, thermal coal imports are unlikely to reach large volumes quickly because of uncertain cost advantages over alternative fuels and because of long lead times required for construction of thermal power plants. Most of the Japanese thermal coal imports, estimated at less than 10 million tons by 1985, will originate from China, Canada and Australia.

The Steel Industry

World steel production remains highly concentrated in a few countries and regions. In 1965 the United States, U.S.S.R., EEC and Japan together accounted for 79.2 percent of the 461.2 million tons produced worldwide, and 76.2 percent of the record 710.5 million tons in 1974. The impact of worldwide recession caused an unprecedented decline in the 1975 steel output to 649 million tons without substantially affecting the proportions by country. Pacific Rim countries

other than Japan and the United States accounted for only 4.5 percent of the total in 1975.

World steel consumption patterns were considerably different, with Japan and the EEC countries experiencing surplus production and all others being net importers of steel. The growth of Japan's steel production and domestic supply patterns from 1950 to 1975 are illustrated in Statistical Appendix Table A-40. European countries have gradually concentrated most of their trade within the EEC block (71.5 percent of the total in 1970). This was in sharp contrast to Japan, which adopted a deliberate policy of promoting rapid steel export growth, averaging 13 percent annually between 1965 and 1970. In 1975 Japan's steel exports, valued at \$10.2 billion, accounted for 18.3 percent of Japan's total exports (9.6 percent in 1960 and 14.7 percent in 1970).⁽¹⁸⁾

The unprecedented success story of the post-war expansion of the Japanese steel industry and its dominant role in stimulating Pacific Rim steel-related trade divides into three distinct periods. The first (1953-60) was marked chiefly by extensive rationalization and modernization of existing steelmaking facilities, construction of large blast furnaces and basic oxygen furnaces, introduction of large ore carriers, the building of port facilities, and the procurement of essential raw materials.

The second phase (1961-73) saw the building of large scale integrated works in new coastal locations to facilitate the import of raw materials and shipments of finished products. The focus was on decreasing fuel inputs and on higher productivity through large scale introduction of basic oxygen furnaces (BOF). The BOF share in Japan's crude steel output increased from 12 percent in 1960 to 80 percent in 1973. Improvements in blast furnace productivity also were achieved by increases in furnace capacities and rapid progress in automation and computerized control. Of the 69 blast furnaces in Japan at the end of 1975, eight were over 4,000 cubic meters capacity and 27 were over 2,500 cubic meters, the highest number in any country of the world.⁽¹⁹⁾

Efforts to reduce coke inputs led to the reduction of the coke rate (coke quantity per ton of pig iron produced) to 435 kg/ton in 1973

(versus 600 kg/ton in U.S.A. and 495 kg/ton in West Germany).

In the third phase (beginning in the early 1970's) a growing proportion of steelmaking investments were accounted for by pollution control measures and (since 1973) energy conservation. Effective utilization of the considerable accumulation of capital scrap in Japan, increased use of sponge iron, replacement of slabbing and blooming facilities with continuous casting, and various schemes to recover wasted energy are some of the current major preoccupations.

Investment expenditures on plant and equipment by the Japanese steel industry averaged about 17 percent of Japanese industrial capital investment in the late 1960's but declined to 14 percent in 1974.⁽¹⁹⁾ In 1975 it increased again to 18.9 percent, reflecting the concerns mentioned above. Crude steel production capacity in Japan is now estimated at 159 million tons, but the latest production forecast for 1980 is only 127-130 million tons and the outlook for 1985 is 160 million tons.

Japan's steel exports are well diversified both in terms of products and destinations. The trend is clearly toward increasing shipments to the developing countries in Asia and the Middle East where industrialization programs have escalated demand. In 1975 Asia accounted for 45.1 percent of Japan's steel exports (33 percent in 1970), Latin America for 9.3 percent (7.3 percent in 1970), while North America declined to 22.3 percent (36.4 percent in 1970). European markets were the only exception from the trend, absorbing 17.1 percent of Japanese steel exports in 1975 versus 15.4 percent in 1970. Although further expansion of steelmaking capacity in such Pacific Rim countries as Canada, Australia, South Korea, Mexico and the United States will gradually increase their share of the Pacific Rim steel production, Japan will remain the largest steel exporter for many years.

8. Other Minerals

Pacific Rim countries produce, of course a variety of other metals and minerals. Two of them, molybdenum and tungsten, will be mentioned separately here because of the concentration of their reserves and production in the Pacific Rim, and because of their technological importance to the industrial economies.

Chromium could be included in the same category because of its technological significance, except that the Philippines is the only significant Pacific Rim producer with about 8.5 percent of the world total. Some 52 percent of the world's current output is controlled by the U.S.S.R. and South Africa and an additional 26 percent by Rhodesia, Turkey and Albania.

Japan's chrome imports, mostly in the form of chromite ore, are well diversified with some 34 percent coming from South Africa. 20 percent from India, 12 percent from the Philippines and 7 percent from the Soviet Union. The United States imports chromite ore as well as ferrochromium, supplementing industrial needs with shipments from government stockpiles. Major chromite import sources in recent years were the U.S.S.R. 31 percent, South Africa 27 percent and the Philippines 18 percent.

Among other metals, the combined silver production of Canada, Peru, Mexico, the U.S.A. and Australia accounts for over 60 percent of all silver recovered as a byproduct of base metal mining worldwide. Japan, Chile and other Pacific Rim base metal producers recover additional quantities, and secondary recovery is an important component of the supply cycle.

Molybdenum

Three Pacific Rim countries -- the United States, Canada and Chile -- contributed about 86 percent of the world molybdenum production in recent years. These three, together with the Soviet Union and Peru, control nearly all the world's molybdenum reserves. The United States

alone accounts for some 57 percent of known reserves and for about 64 percent of world production. Although Canada controls only about 4 percent of reserves, it supplies about 15 percent of world production.

About one-half of all molybdenum production is derived as a by-product of copper mining and its supply is, therefore, directly related to the mining of certain copper deposits. Molybdenum may also be recovered from other ores, including uranium.

The use of molybdenum as an alloying element in steels determines its international trading patterns, with Japan the foremost importer, followed by the EEC countries. The industry is closely controlled by only a few corporations with only one company in the United States (AMAX, Inc.) and one in Canada (Placer Development Ltd.) playing the leading roles.

World molybdenum production increased from 33,897 tons (in terms of metal content) in 1960 to 82,194 tons in 1973, of which about 35 percent was traded internationally. As new supplies enter the marketplace in the future, price competition should become more pronounced than it has been in the past. The long-term outlook is for oversupply of molybdenum in international markets, including the Pacific Rim.

Tungsten

Both the market economy and the central economy countries of the Pacific Rim are important producers of tungsten as shown in Statistical Appendix Table A-42. Although nearly 60 percent of estimated world tungsten resources are located in southeastern China, very considerable reserves are found in Canada, the U.S.A., North and South Korea, Thailand, Burma and Australia. Outside the Pacific Rim, Brazil, Bolivia, and Portugal are important tungsten producers with considerable reserve potential.

Tungsten production in the Pacific Rim varied widely during the last twenty years, the major factors being the U.S. stockpiling program in the 1950's and a disposal program of excess stockpile supplies in the mid-1960's. Present U.S. domestic production is obtained almost entirely from only two mining operations, as a co-product with molybdenum. U.S. production potential is considerably higher and new

projects could increase U.S. domestic production by about 25 percent in 1978. Canadian tungsten production comes from only one mine, although several other deposits have been identified.

Thailand, South Korea and Australia are all capable of increasing tungsten production beyond the present level and are likely to do so when market conditions warrant. North Korea, despite a strong reserve position, has maintained a slow growth rate and has not been a factor in the Pacific trade.

Extreme hardness, wear resistance and favorable properties at elevated temperatures make tungsten an important material in industrial, military, and space applications. With both economic and strategic significance, the United States and Japan are by far the two largest Pacific area tungsten-consuming markets.

Historically, tungsten prices have tended to fluctuate in response to major shifts in U.S. stockpiling policies and to a rather unpredictable pattern of annual sales by China. World prices doubled between 1973 and 1974, and increased another 50 percent by 1976.

Tungsten's volatile price behavior led to discussions, under the auspices of UNCTAD, on measures to stabilize price patterns. Major differences of opinion have delayed resolution of the problem. Some of the tungsten producers also formed the Tungsten Producers Association in 1975 with Australia, Bolivia, Peru, Portugal and Thailand as members, and China as an observer. Without the United States, Canada, South Korea and the European producers, the Association is unlikely to exercise a strong influence on the tungsten market, but may become a factor in UNCTAD negotiations.

9. Changing Investment and Trading Environment

Mineral Investment Climate

Metal and mineral ores are widely but irregularly distributed in the Pacific Rim countries. Many factors influence the development of metallic ores, including their physical characteristics and chemical composition, accessibility, availability of infrastructure and market price trends.

Developing countries, with their limited capital markets and undeveloped technical and marketing skills, have been highly dependent on international money markets and the resources of multinational corporations for financing mining and mineral processing projects. The willingness of international capital to flow to a given country has always been determined by the degree of economic risk, including the ability of the investors to remit convertible currency for servicing loans or dividend payments. This topic is discussed further in Drysdale's paper in these Proceedings.

During the 1960's, the growth of pressures for greater economic sovereignty in the developing countries, their desire to exercise ever greater control over their own resources, and to obtain increased value through local processing led to confrontations between some governments and the multinational corporations. These actions introduced a new critical element in investment decisions that has become known as "political risk analysis," and that has been responsible in part for a pronounced shift of new mineral investments away from such areas as Latin America and into Australia, Canada and the United States.

During this time, major investments took in iron ore projects in Australia and Canada rather than in Venezuela or Peru, copper deposits in British Columbia and the Philippines rather than in Chile or Peru and bauxite in Australia instead of in the Caribbean countries

Exceptions to these patterns occurred, of course, in particular as they related to the Japanese preference for mineral development through debt financing rather than through equity control. The Japanese, generally, took only minor equity positions in large mineral development projects while advancing a large part of the required development funds as debt capital repayable by delivery of the contracted product. Their use of long-term contracts is discussed in detail in the Kojima paper in these Proceedings, and to some extent in the paper by Smith.

Investors and developers have been justifiably concerned over growing difficulties in attracting capital and the required managerial and technical skills to mineral development projects in countries

where investment terms and conditions are likely to be unilaterally changed during the lifetime of the investment. Host governments of most resource-producing countries now insist on a substantial, if not controlling share of local equity and on a maximum possible degree of local processing before export. To redefine a realistic balance of interest between mineral developers possessing capital and know-how and host countries that own the resources is a major and complex task. There are strong indications that, notwithstanding the complexities of the problem, new forms of cooperation are being successfully introduced.

Institutional Factors

As a result of extensive discussions held under the auspices of the United Nations Conference on Trade and Development (UNCTAD), an Integrated Program for Commodities has been proposed which calls for a number of far-reaching reforms in the world commodity trading system to stabilize prices and generally aid LDC producers, including internationally negotiated commodity agreements for such metals and minerals as bauxite, copper, tin, manganese and phosphate. Among the proposed reforms the most significant are the establishment of a common fund to finance commodity stockpiles, the introduction of a price index system between primary commodities exported and manufactured goods imported by LDCs, and generally improved LDC access to developed world markets for semi-processed and manufactured products.

While it is likely that the proposed reform package will be considerably trimmed and modified, indications are that certain significant concessions will be made by the developed countries. Expansion of the preferential trading system, or granting trade advantages to certain developing countries without reciprocity, will have a net effect of eroding comparative natural advantages in specific export markets presently enjoyed by some suppliers. Certain moves in this direction have already been made, such as the General System of Preferences (GSP) introduced by Japan and the United States, and the concession extended by the EEC under the terms of the Lome Convention

of 1975. Although it is presently designed to deal primarily with the agricultural commodities, provisions exist for inclusion of certain mineral products. The Convention also provides for the establishment of funds to assist in the development of capital projects, including mining, and for extension of technical cooperation.

While most industrialized countries accept that there are advantages to be gained by both producers and consumers from controlling cyclical swings in commodity prices, and that buffer stocks are a more sensible stabilization technique than production and export controls, there are major differences of opinion concerning objectives, sources of finance and methods of operation of a common buffer stock fund.

Given the complexity of the problem and the likelihood of protracted negotiations over individual commodity agreements, the effect of any new international arrangement is unlikely to be felt in the marketplace for some years. Nevertheless, new international institutional arrangements will become a factor in the mineral market because both consumers and producers have a vested interest in limiting the gyrations of mineral commodity prices.

Investment Costs and Capital Supply

A number of factors have increased mining and mineral processing costs and lowered profitability in recent years. These include increasing capital intensity, higher energy costs, rising labor costs and weak mineral prices.

The economic viability of exploiting ever lower grades of ore depends on application of the most advanced technological methods and equipment and on the economies of mass production. This in turn, requires massive capital outlays that can only be justified under conditions of firm long-term contractual commitment from consumers to absorb at least a major share of the output. Some copper deposits in the Philippines, Papua New Guinea and British Columbia now under development have ore grades sometimes less than 0.4 percent copper content. Development of Australian iron ore deposits, despite their relatively high quality, was made possible only by large international

mining consortia that undertook the production, transportation and marketing of millions of tons of ore annually.

Capital requirements for new production capacity vary depending on the location, ore grade, availability of infrastructure, antipollution requirements and other factors. While generalizations are always dangerous, it is undeniable that current copper price levels are much too low to provide sufficient incentive in underwriting new projects. Capital requirements of an integrated copper mining and smelting project today are estimated to be twice as high as in 1970. While the needs are different, the same principle applies to the capital required for new primary aluminum capacity, which has more than doubled since 1970.

Energy costs also have had a particularly severe impact on energy-intensive metallurgical processes. While a great variety of measures have been taken by the industry since 1974 to reduce the impact of rising energy costs, most metallurgical processes have a very considerable energy component. Under conditions of abundant and cheap energy supply prevailing in the past, little attention was paid to the weight of energy in total production costs.

Inflationary trends in the 1970's accelerated the rise in labor costs, particularly in the industrialized countries of the Pacific Rim. Wage rates in mining and mineral processing sectors of Canada, the United States, Australia and Japan have risen considerably while some commodity prices have declined and others have barely kept pace with inflation.

Base metal prices, which are more directly subject to market forces, declined at a more rapid rate in 1975-76 than they had risen in 1973 and early 1974. On the other hand, prices of other minerals, such as metallurgical coal and bauxite, have risen under the impact of the energy crisis and coordinated producer actions. These trends imply that future capital flow will be constrained by lower profitability and higher risk factors at a time when the industry has become increasingly capital intensive. Under conditions of intensified competition for investment capital, such capital flow is likely to be attracted to

projects offering the lowest degree of risk in terms of profitability and political stability.

Although the ability to generate domestic capital will gradually increase in many Pacific Rim developing countries, most of their mining and mineral processing projects will continue to require huge amounts of foreign capital. Given their limited foreign currency earnings from exports and the reluctance of international organizations and institutions to finance mineral development, the most readily available sources of foreign capital are international private banking consortia and private investors.

A trend appears to be emerging, therefore, towards an international consortia approach to large scale mineral mining and processing operations in order to minimize financial risks and to enhance the economies of scale. These consortia often include the backing of financial institutions from a number of countries and participation by local governments or state corporations. Technological and management skills have become a marketable package on their own, without necessarily being linked to equity ownership and control.

10. Conclusions

Many interrelated factors have shaped the mineral mining and processing industry in the Pacific Rim. Rising mineral consumption in the developed countries brought about rapid mineral development in the main mineral-producing developed countries while at the same time increasing the importance of the mineral industry in the economies of many mineral-rich developing countries.

Minerals and metals became an increasingly important source of foreign exchange and a strong catalyst in the development of national infrastructures in the LDCs. This, in turn, has led to the growing role of governments in determining mineral policies and in the actual ownership of mining and mineral processing enterprises.

In their desire to exercise increasing influence over mineral

markets and to increase the returns from exports of mineral commodities, governments have tended to join in the establishment of mineral producers associations. This included the developing as well as the developed countries of the Pacific Rim, with the notable exception of Canada and the United States which favor joint producer-consumer arrangements.

Growing scale in mineral mining and processing projects, concerns over environmental protection, inflationary trends in capital equipment and labor costs and rising energy costs are among the important factors that have limited capital investment in exploration and development.

Consuming-country concerns over long-term security of supply and producing-country demands for higher levels of processing before export are at the root of the debate over future policies. This struggle highlights the interdependence of producing and consuming countries made inevitable by the uneven distribution of natural resources and the growing desirability of broad-based international consortia as an approach to mineral exploitation.

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MINERAL TRADE AND INVESTMENT PATTERNS IN THE PACIFIC AREA
A COMMENT

Sirman Widiatmo

My compliments to the author on the excellent survey of the production and trade patterns of the major minerals over the past two decades or so. He has identified the main characteristics of the markets for copper, lead and zinc, aluminum, nickel, tin, titanium, iron, coal, steel and other miscellaneous minerals.

In fact, the bulk of the paper covers this subject matter and only a few pages are devoted to the investment patterns. The specific data presented on the individual minerals can be very useful in studying the broader subject of the role of these minerals in the future world economy.

We agree with the conclusion that the rise of mineral consumption in the developed countries has brought about an increase in production in both the developed and the mineral-rich developing countries.

For the continued orderly development of future mineral production, we suggest that there must be full cooperation between the producers in the developing countries and consumers in the developed countries. Each sector has rights as well as obligations and they both go together. There are many imponderables and uncertainties in predicting future supplies and demands for minerals, and thus it is important that the consumer countries aid the producer countries during the low demand periods of a cycle so that ample supplies will be available during the peak periods.

We agree with the observation that minerals and metals are an increasingly important source of foreign exchange which aid in development, and therefore governments are taking a more active role in setting policies in the exploration, mining, milling and marketing of the minerals.

Rather than an interdependence of producing and consuming countries, as suggested, we propose that there is more a mutual needs and interests relationship between them, a real community of interests.

The objective of the producers should be the orderly development of supplies. There should be no waste of capital resources in surplus capacity and no trade or investment barriers. The requisites of the consumers are to help in providing technological assistance for efficient mining and processing and to pay remunerative prices. Consumers should help finance stocks in times of temporary oversupply in order to maintain production capacity.

We were pleased to note that the author had identified some innovative schemes which seem to illustrate investment arrangements for the future, such as through international consortia, or through debt financing as opposed to equity financing as in the case of Japan. Yet, since the developing countries have a mounting debt, can the latter scheme be expected to continue in the future?

The author has documented the unprecedented growth in demand for minerals and metals in Japan, the U.S. and other industrialized countries very well. Since Japan is not a nation with abundant resources, it will continue to be dependent on large imports of iron, copper, coal, nickel, tin and aluminum.

In our opinion, 1974 was a peak year for the consumption of minerals and therefore it is a mistake to use 1974 as a yardstick.

On the question of the U.S.A. stockpile, it is stated that a new set of major long-range planning goals was adopted in 1976. But this is not the case, as they were merely recommended to the President of the U.S.A. and have not been acted upon as yet. Consequently, the U.S.A. stockpile still constitutes a threat of additional supplies, influencing the investment climate.

The logical mineral market for Canada, a country of some 22 million people, is the U.S.A., and the logical market for Australia is Japan. The author's statistics substantiate this conclusion.

We agree with the author that it is a major task for each Pacific Area country to devise schemes which will ensure efficient exploration, production and trade in minerals. He states that in the 1970's,

some 80 percent of worldwide exploration expenditures have been made in the developed resource-rich countries -- namely Australia, Canada, the United States and South Africa -- rather than in the developing countries. The answer to the question -- why not in developing countries -- would be of paramount importance.

Geology is not a function of national boundaries. Adjacent countries with the same geological setting can be expected to have similarities in mineral endowment.

During the discussion of the markets for the individual minerals, we would like to add emphasis on technological changes, such as substitution, new mining and extraction methods affecting costs of production and also on the effect of releases from stockpiles on conventional supplies. With these developments in mind, how can the consuming countries guide the producing countries to make sound investment decisions?

For example, in the case of copper, there is substitution by aluminum, new extraction techniques both pyrometallurgical and hydrometallurgical, new environmental regulations on sulfur dioxide emissions, and declining prices as well as a world oversupply.

The estimate for lead and zinc resources worldwide is at least 1.5 billion tons of lead and 2 billion tons of zinc. A recent U.N. study by Wassily Leontief, entitled "The Future of the World Economy," lists only 235 million tons (metal content) zinc reserves and 129 million tons (metal content) for lead reserves. On the other hand, the author did not mention the large amount of lead recycled annually and the relatively small amount of zinc recycled.

We agree with statements on the aluminum industry maintaining that since the aluminum smelting process is a high capital cost industry, it has been located to date in developed countries. However, due to the fact that aluminum production requires 7 to 10 kilowatt hours per pound, the new trend should be to locate the factories in cheap hydroelectric power areas. Our Asahan aluminum project in Indonesia is a good example.

We confirm the statements that Indonesia should become the third largest producer of nickel in the western world in 1980, with an

expected output of 115,000 tons annually from P.T. Aneka Tambang, P.T. Inco and P.T. Pacific Nikkel Indonesia.

On the question of preference for Producers Associations rather than Producer-Consumer Associations, I can only state that Indonesia was a founding member of the International Tin Agreement in 1956. But allow me to withhold my comments on the tin industry until the discussion of Mr. Ariff's paper. Indonesia's action was taken despite the fact that tin has better ingredients for a successful cartel than OPEC.

On the subject of titanium supply, I would like to stress the recent substitution of beneficiated ilmenite for natural rutile which has been accepted by the titanium pigment and metal industry. The new Kerr McGee plant in the U.S.A., at 100,000 ton annual capacity, the new 60,000-ton Malaysian plant, the Australian 30,000-ton plant, the Indian 20,000-ton plant and the Taiwanese 30,000-ton plant have filled the gap of a potential natural rutile shortage.

The substitution of chromite and olivine sands for zircon has reduced the demand for zircon so that today we have a world oversupply of zircon.

The author's coverage of the iron ore, coal and steel industry is quite complete. The prices of the strategic metals tungsten and molybdenum continue to rise and the impact of Chinese supplies of tungsten and new molybdenum mines in the U.S.A. could bring about drastic change.

On the question of investment we believe a transfer of technology is needed so that the developing countries can protect the known supply lines. Commodity agreements can bring stability to the market place which should encourage investment.

In summary, we believe that studies on production and trade patterns of minerals are necessary as they are useful and relevant in identifying the main characteristics of the market. Producer countries as well as corporate investors are always faced with uncertainties of estimating future supply and demand for the irreplaceable minerals.

We believe that, in most instances, the long-term security of

supply is mainly a question of the right prices at the right time to encourage mineral production. Therefore closer cooperation is needed between producers and consumers to deal with cyclical market developments or temporary market disturbances.

MINERAL TRADE AND INVESTMENT PATTERNS IN THE PACIFIC AREA
A COMMENT

Francis K. Chan

Mr. Switucha is to be commended for the enormous effort that he has put in to give us this very comprehensive and useful survey of the non-fuel minerals situation in the Pacific Rim region. Some 15 Pacific Rim countries are included as well as 14 major minerals.

The paper is comprised of three major sections: (1) Minerals in the Economies of the Pacific Rim; (2) Production and Trade Patterns of Major Minerals; and (3) Changing Investment and Trading Environment. In the first section, the experiences of both developed countries (Japan United States, Canada and Australia) and developing countries (grouped into the three regions of Southeast Asia, South Pacific and Latin America) were discussed in some detail. Indicators of the importance of the minerals in the economies of the countries used in the paper included percentage share of total annual imports and import dependence. Percentage share of GDP and percentage of total export receipts were used in the case of mineral exporting countries.

In the second section, the focus of the paper shifted from the countries to the production and trade patterns of the major minerals. In addition the paper also included a discussion of the reserves position and future outlook. The geographical distribution of mineral deposits in the Pacific Rim is uneven, with relative resource abundance in the South (Indonesia and Australia) and North East (Canada and U.S.) sectors and deficiency in the North West (Korea, Taiwan and Japan). This contrasts with the growth in demand especially during the 1960's and early 1970's which was greatest in the North West sector. Because of this uneven distribution, the trade pattern has been one of resource extraction in the South and North East and shipment of largely unprocessed ores to the North West of the Pacific Rim and also to the North East (U.S.). This pattern was further strengthened by the Japanese

policy of encouraging domestic processing of imported ores rather than processing at site.

With respect to the long-term prospects of future supply, the reserves of most of the minerals in the Pacific Rim countries comprise a significant share of global reserves. Supply may be adequate especially because the growth rates of consumption for some minerals have slowed down or may slow down (copper, lead, zinc, tin), or because of future technological advances in sea-bed mining, in the rate of per unit usage, or in development of substitutes (nickel, tin, titanium). In the short term, a number of minerals are experiencing overcapacity and an unattractive price situation due to overexpansion of supply (copper, lead, zinc, steel).

However, the above trade and production pattern may undergo some changes. In the case of mineral ore processing, there will probably be a shift towards more processing at source. Among the reasons are the effect of increasing energy costs (hence processing of bauxite and aluminum in locations with abundant hydroelectric power), greater concern about the environmental effect of processing in Japan, and the desire of mineral-producing countries to exercise greater control over the exploitation of their resources and to encourage greater value by processing at source to obtain a larger share of the economic rent. This trend will probably have net beneficial effects all around and make economic sense.

A more serious change -- highlighted by Mr. Switucha in the third section of his paper -- is the change in investment patterns that would come about due to a deterioration (from the investors' point of view) of the investment climate in some developing countries on the one hand and rising capital costs of investment due to price inflation, distance and isolation of new mining sites, lower grades of ores, and the need to use more capital-intensive and technologically complex methods and equipment on the other. While these factors would result in more investment in mineral development in the Pacific Rim, it would tend to be located in the developed countries because of the investment risk factor. The other possible consequence of the increase in capital cost is the adoption of an international consortium approach to financing

which would spread out risks to individual investors while taking advantage of the economies of scale in mining and processing.

Taking the discussion of this paper in conjunction with the Magee-Robins paper on the raw material cycle, one implication seems to be that resource-poor developing countries need not fear that future raw material scarcity and global competition for access to the limited supply would be a serious additional constraint on their future development prospects. For the resource-rich developing countries, the bonanzas promised by their possession of mineral deposits through OPEC-style operations seem highly unlikely.

Even if the above scenario is a reasonable one in the future, there would seem to be unavoidable and continual short periods of resource scarcity because of the difficulty of matching supply and demand over time, giving rise to wide price fluctuations. This is likely to be true because of short-run price inelasticity of supply due to long lead times of investment coupled with unstable demand conditions -- also likely to be price inelastic in the short-run.

There are two specific points on which I do not share the author's opinion.

The first one refers to the first section of the paper, where Mr. Switucha comments that "The contribution of the mining sector to the Malaysian economy has always been unimpressive...", citing as evidence the fact that "mining accounted for 4.0 percent of gross domestic product in 1975 compared to 5.7 percent in 1970" and that "The export value of tin...amounted to 13.4 percent of total export receipts." In terms of these indicators, the figures for the 1950's and 1960's (to stick to the postwar era only) are much higher, about 10 percent of GDP or higher in some years. This is by no means an unimpressive role. Because tin mining tends to be relatively more labor-intensive than most mineral mining, the contribution to direct labor employment is also quite substantial. The contribution of tin to government revenue has been even more substantial since a large fraction of government revenue was formerly derived from export taxes. Also, historically, the development of the tin industry was an important factor in stimulating migration of Chinese labor and infrastructural development in

the Western states of Malaya, which subsequently contributed to the development of the rubber industry in Malaysia.

The second point on which I would like to register disagreement is Mr. Switucha's evaluation of the role and performance of the International Tin Council. He suggests that it is "helping to stabilize export earnings of the producing nations" and "also assisting in reaching rational decisions on production rates and on additional investment required to secure adequate supplies to the consumers." In the paper by Mohamed Ariff for this Conference, it is shown that while empirical evidence seems to suggest reduced price instability under periods of international tin control, "tin controls have tended to destabilize output, employment and export proceeds,...export controls have rendered Malaysia's tin export proceeds rather unstable, despite relatively stable tin prices, price stability being more than offset by export volume instability." This results from the fact that, "movements in price and quantum have tended to be rather additive." Given the short-run price inelasticity of tin production and the volatility of derived demand, further attempts to stabilize price, especially through export controls, can only destabilize export proceeds. The same study also goes on to point out the economic inefficiency of the tin control mechanism, in particular the tendency to prevent movements towards a more efficient resource allocation within the country and the protection of less efficient high-cost producers generally.

MINERAL TRADE AND INVESTMENT PATTERNS IN THE PACIFIC AREA

GENERAL DISCUSSION

The paper covered two main topics: government involvement in mineral exploitation and the location of ore processing. Capital market and stockpiling questions were also considered.

Government Involvement

Maintenance of price stability and orderly markets were the principal aspects of government involvement discussed. Diamonds were cited as an example where private producers have successfully maintained a high degree of market control (for at least the gem stone part of their market).

Stabilization of supply growth as a goal implies the need for an international MITI (Japan Ministry of International Trade and Industry) allocating new mine openings among countries as demand expands and old mines are depleted. But it is unrealistic to expect such sequencing to be politically acceptable. One consequence of nationalization (or extensive control) is that governments have wanted to keep their own capacity fully utilized no matter what. Because of political welfare considerations, it is more difficult for a government to decide to cut back production.

The increased role of government has thus led to supply being less sensitive to market conditions. The consequences of this are a major cause of concern for nonferrous metals producers generally and copper producers in particular.

There is also the paradoxical situation of nationalization leading to subsidized exports and loss of rents: revolution is the opiate of the masses.

The below-equilibrium pricing policies and accompanying disequilibrium on the supply side can have devastating effects on a country: the impact of low copper prices on Peru's economy is an example and a warning that prices should be moved up to at least the equilibrium

level for commodities that are so singularly important to an individual country. Such a country cannot afford the luxury of price swings.

To achieve a more efficient long-term expansion path may require returning enterprises to the private sector or at least achieving more cooperation between the government and the private sector. One participant noted that mining companies are unusually articulate in expressing their troubles with governments. This led to some brief comments on capital markets.

Private firms may be more risk averse in troughs than at peaks, and it was suggested that the paper deal more with these implications. One manifestation, although a strange way to deal with risk, is the prevalence of consortia formation in troughs, while in boom periods firms are more likely to go it alone.

A study of Canadian firms showed the mean rate of return is lower, and the risk higher, for mining companies relative to others -- so there may be a pool of capital investing almost exclusively in mining. On the other hand, there may be a lot of high-risk takers in the investment world. It is also important to distinguish existing capital being reinvested from actual new capital flowing into the sector.

Processing

Whether the mining country should develop its own processing capability rather than export raw ore was a topic repeatedly commented upon.

Processing is usually considered more labor intensive than mining, but this was not universally accepted as true -- in part because of questioning the generalization that mining is of necessity capital intensive. It was pointed out that scale economies are such that on-site processing is not always feasible, but developing countries tend to look at processing as contributing to employment and infrastructure development.

A producing country must consider more than just the pure economic returns. If processing is indeed more labor intensive, it will possibly have a social rate of return high enough to justify the economic costs. The importance of a case-by-case evaluation was

stressed by both this speaker and the author, who noted that extensive studies suggested it is not attractive to do simple copper smelting in Canada. In part, this is because of the existence of a good deal of relatively new, currently underutilized capacity in Japan, the main market, as well as Japan's tariff structure and the high cost of building processing plants.

The logic of going to processing is often assumed by producing countries without actually analyzing the opportunity cost of the factors to be used. If the same analysis were applied to mining itself it might even suggest cutting back on resources allocated to it.

Higher energy costs are a deterrent to new processing plants in energy-poor countries. It was also pointed out that sometimes the only foreign capital available to a developing country is for exploiting its minerals.

A Japanese participant noted that Japan had encouraged producers to move into processing in the early 1970's, but subsequent world overcapacity in such areas as copper has curtailed this.

Stockpiling

A nine-volume study for the U.S. government concludes stockpiling is not economically feasible as there is little real potential for cartels in the minerals with which the U.S. is concerned.

Another participant pointed out that stockpiles are strategic rather than price stabilizing in intent, and also that existing ones have been used to balance the budget.

Other

While the role of research and development has been stressed, it was noted that exploration has had as much or more to do with available mineral resources, and its determinants are somewhat different than those for R and D. Specifically, it was suggested that much of this investment was made to secure market shares. This relates to the establishment of private oligopolies. Governments have seen the concentrated power and in many cases have moved to take it over. This process is irreversible.

Switucha's comments that the contribution of tin to Malaysia was minor were challenged, and his claim that mining was the fastest growing sector of the Philippine economy was questioned.

RESOURCE TRADE AND THE DEVELOPMENT PROCESS
IN DEVELOPING COUNTRIES

Ross Garnaut

Demand for resource-intensive commodities is strongly correlated with industrial production. Although there were some early linkages between the location of certain resource deposits (such as coal) and the process of industrialization in the now-developed economies, the natural deposits from which resource-intensive commodities are produced are scattered more or less independently of the location of demand. Transport costs tend to be high in relation to the value of many resource-intensive commodities, so that resource deposits (of equal physical quality to those located elsewhere) are mined first in the vicinity of the main centers of industrial production. This means that continued growth in the industrial economies generates opportunities for profitable expansion of production of resource-intensive commodities from locations that are further and further from the main industrial centers, including those from developing countries. A shift in the location of world industrial production towards some developing countries can produce a similar effect for those countries.

These relationships have been very important in the Western Pacific region since the early 1960s. All Southeast Asian economies except Singapore, all of Melanesia, and the high-income, largely industrial countries of Australia and New Zealand, are characterized by low levels of industrial production in relation to their natural resource endowment. This has been reflected historically in strong export specialization in some resource-intensive commodities. However, high transport costs (and to a lesser extent transactions costs) associated with trade in resource-intensive commodities with the distant industrial centers of Europe and North America long denied economic value to some known resource deposits of high physical quality

(for example iron ore and bauxite in Australia and copper in Indonesia). It also discouraged thorough exploration of the region's natural resource endowment.

High rates of world industrial production through the 1960s and early 1970s extended the margin of profitable production of resource-intensive commodities. The concentration of much of the world industrial growth in Japan, a resource-poor neighboring country that by the late 1960s had become by far the world's largest importer of industrial raw materials, magnified this effect for countries in the Western Pacific region. Opportunities for the development of new export industries were further enhanced by innovations in bulk transport techniques, which themselves were inspired partly by the extraordinary growth of Japanese import demand.

In response to these developments, the export specialization of all Southeast Asian economies strengthened through the 1960s in precisely those commodities in which Japanese import specialization was strongest. A similar transformation occurred in the export specialization of Southwest Pacific countries, including Australia, Papua New Guinea and the small territories of Melanesia. New industries producing nickel were advanced in Australia and Indonesia; new industries producing copper in the Philippines, Papua New Guinea and Indonesia; and major new iron ore, coal, alumina and bauxite exporting industries in Australia. Established export industries were greatly expanded: oil from Indonesia and Malaysia; nickel from New Caledonia; copper from Australia.

This paper does not aim to describe the experience of these countries. Rather, it seeks to identify the nature of opportunities and problems associated with these developments in an abstract way. From time to time, reference is made to a particular industry or a particular country, but this is simply illustrative. We will keep in mind the important case of the minerals and energy industries, but part of the discussion could be applied to other resource-based industries, including forestry, fisheries and agriculture.

There have been many case studies of the impetus to development provided by the exploitation of mineral resources in developing and

now-developed countries. A number of models of trade and development have emerged from these studies. Caves¹ has reviewed the studies and distilled their common features into a statement of a "vent for surplus" model of international trade and economic growth. Caves' model provides a good starting point for the present discussion, although the "vent for surplus" label is misleading. The term "resource trade" is used in preference to "vent for surplus" in this paper.

Caves defined the limiting case where all resources complementary to the natural deposit were obtained through migration from industrial countries. The limiting case is no longer interesting in itself (except for the analysis of development in resource-rich regions within some countries), but the model is applicable with adaptation to many contemporary economies.

The "resource-trade" models depict the effects of trade on growth as involving the exploitation of resources lacking, in that place and at that time, any alternative uses of any significant economic value. The exploitation of natural resources in the resource-rich country proceeds at a pace determined by the rate of discovery of resources and by growth in world demand for the relevant commodities (whether through growth in total industrial production or shifts in demand that are favorable to the increased use of the relevant commodities). When changes in the general economic environment cause the establishment of a new export industry to be profitable, the process of growth is an adjustment to a disequilibrium situation, and the short-term rate of growth is limited only by the constraints on that adjustment.

The growth of the resource-exporting sector gradually increases the scale and diversity of the domestic economy. Production of non-tradeable commodities increases as demand rises with the spending of incomes earned in the exporting industry. Import-competing production is extended as successive thresholds of minimum necessary scale of domestic demand for efficient production are exceeded in various industries. It is possible for "resource-trade" growth to be superimposed upon an underlying swell of "neoclassical" growth, with the

latter taking the form of gradual increases in population and capital and improvements in technique. In this latter case, "resource-trade" growth can explain a large part of the variation in the growth of the resource-rich country, whether or not it explains a large part of the average level of that growth.

The "resource-trade" literature draws the conclusion that the process of growth, and the extent of the export-impetus to general growth, depends on the nature of the linkages with the domestic economy, without getting very far into the analysis of the effects of particular linkages. The linkages can be of a direct kind (through the production functions of the resource-based industries, or of industries requiring the resource-intensive products as inputs), or of an indirect kind (through the effect of the increase in incomes on domestic demand). The indirect effects depend on the magnitude and the distribution of resource rents.

The next section of this paper describes some of the distinguishing characteristics of the resource-based industries, resembling somewhat the general characteristics of industries based on minerals and energy resources in the Western Pacific region. This description of characteristics is a necessary prelude to analysis of export growth on the domestic economy. Discussion then proceeds to the organizational structures through which production and trade are conducted in the resource-based industries. Further sections are devoted to direct linkages, and to the quantitatively more important indirect linkages through the expenditure of resource rents. Two sections discuss the macroeconomic impact of the resource developments: first, the impact on expenditure, employment, the balance of payments and the sectoral composition of domestic production; and then the special problem of instability. The paper then turns to the effects of the development of new export sectors on long-term growth and income distribution. It concludes with some comments on questions of international economic policy that arise out of the paper as a whole.

1. Characteristics of Resource-Based Industries

The new resource-based industries tend to use complex technology and require a highly sophisticated organization to coordinate financing, construction, production and sales. They are typically highly capital-intensive, using little labor or other inputs that can be supplied domestically in non-industrial economies. Productive capacity is lumpy, and the expansion of production tends to proceed in large, discrete steps. Activity in these industries tends to be highly concentrated regionally at the location of the natural resource deposits. Finally, the contribution of these industries to domestic incomes and economic activity tends to be highly unstable.

Some of the common characteristics listed above are causally linked to each other, or have common origins. The common reality that natural resource deposits in non-industrial countries are located away from established infrastructures raises the minimum scale of feasible operations, and also their capital-intensity. Large-scale operations require more sophisticated organizations, the nucleus of which must usually be provided from foreign sources. The highly capital-intensive nature of production helps to make supply less sensitive to short-term price instability in world markets, and so contributes to that instability. The regional concentration of production follows mainly from the uneven bounty of nature, but it is also affected by the high minimum efficient scale of operation and the associated lumpiness of additions to productive capacity.

There are two aspects to instability in the contribution of the resource-based industries to incomes and domestic activity. Investment is lumpy, and tends to come in waves associated with buoyant external economic conditions and particular developments in technology. This subjects domestic economic activity to considerable stimulus during the period of investment and early production, but dampens aggregate growth upon the withdrawal of this stimulus. Secondly, there are commonly wide fluctuations both in the volume of

exports and the price of resource-intensive commodities. Demand for industrial raw materials in the developed economies varies more than industrial production, being caught up in the inventory cycle. Supply rarely adjusts downwards period, while and when it does the market knows that there is considerable productive capacity overhanging the market, and that output can be expanded at low marginal cost. In the long term, supply adjusts downwards only when prices fall below the marginal cost of less efficient producers for a considerable period, while it adjusts upwards only when prices have been maintained at high levels for sufficiently long to induce confidence that satisfactory returns will be achieved on the large capital investment required to add to world productive capacity.

There is some speculative variation in inventories at all levels of production and in use of industrial raw materials, and this exerts a modest stabilizing influence on price when general economic events are unfolding in more or less predictable ways. But the anticipated "equilibrium" price can swing wildly with changes in community expectations about future growth in world industrial production. The price that is sufficiently high to keep existing capacity in production, and perhaps to add a small, incremental amount to existing capacity each year, may be only half that required to induce major additions to capacity. Expected "equilibrium" prices thus vary widely depending on expectations as to whether industrial growth will be sufficiently rapid to require major additions to the annual supply of resource-intensive commodities. Changes in the general expectation of industrial growth can cause speculation itself to bring about fluctuations in price, as illustrated by the rise in many metals prices through the first half of 1976, and the easing after mid-year.

There are exceptions to various aspects of the characterization of the resource-intensive industries presented here. Mining techniques are not all equally complex and capital-intensive. The contribution of labor and of domestic organizations to production is more important, for example, in tin mining in Malaysia. In these exceptional cases, regional concentration is also likely to be less severe.

Similarly, there are exceptions to the general tendency for prices of resource-intensive commodities to be highly unstable, because producer cartels are able to vary output to maintain price (petroleum, aluminum, uranium) or for other reasons. However, the generalizations have wide applications, and we will proceed on that basis, pointing out exceptions when they are important.

2. The Organization of Production

The establishment of a new, resource-based exporting industry requires the assembly of a wide variety of manpower skills within a sophisticated organizational structure. Many of the skills must at first come from outside the host country, as must the organizational structure itself in the early days of resource development. The foreign skills and organizations are both expensive, and their use reduces the amount of rent that is available for the augmentation of domestic incomes. Less recourse to these foreign factors is required the more developed the domestic economy becomes.

As new producers of many of the resource-based commodities that became important in their exports from the 1960s, developing countries in the Western Pacific region had to reach accommodation with foreign firms in one way or another. Only in Australia and the Philippines did private, domestic firms take up major equity positions in large projects. Foreign direct investment was very important even in these countries, and was vital to the initiation of all new ventures in the Philippines.

State corporations employing foreign firms to manage projects on a contract basis have been used extensively outside the region, but not as yet in the Western Pacific. The most important state corporations are the national petroleum companies of Indonesia and Malaysia, but foreign companies work in partnership with them under "production sharing" arrangements which are equivalent to direct investment in their practical economic effects. The role of the national corporations is more that of a regulatory authority than an initiator of investments or a risk-taker.

The "production-sharing" arrangements pioneered in Indonesia after the nationalization of Shell in the early 1960s, and now used extensively in the region and beyond, take the legal form of investment by a state corporation which employs a foreign firm on a contract basis. However, the foreign firm commonly assumes the whole risk of failure, finances the project, manages it, and earns high returns if the project is successful. The popularity of production sharing arrangements is no doubt due to the fact that they combine the form of national ownership with the realities of foreign direct investment, and they have been acceptable politically in some countries in which the old form of direct investment was unacceptable. Production sharing arrangements, at least in the form in which they were then most commonly conceived, were harmed by a United States Internal Revenue Service ruling in 1976 that production shares made available to the authorities would not be classified as income taxes for the purposes of credits against United States tax obligations. This development has inhibited petroleum development in Southeast Asia through 1976 and early 1977 while modifications in production sharing agreements have been under negotiation and under examination by the Internal Revenue Service.²

3. Direct Linkages

The characteristics of the resource-intensive industries defined above suggest a limited role for direct linkages. The amount of labor employed is very small in relation to the value of investment and production, and part of the demand for labor must be met from overseas. The direct impact on the domestic economy through payment of wages is greater in a more developed economy in which wage rates are higher and a wider range of skills is available from domestic sources. The mining operations themselves can be important to the accretion of industrial and managerial skills, although the quantum of these effects will be small in relation to the value of production, and also in relation to the size of the host economy in all but the smallest countries.

The major resource projects are usually the largest and most sophisticated business enterprises in a developing country, and their presence provides an important demonstration of business methods or organization. This can be helpful to standards of business organization elsewhere in the economy, and even in the government itself.

The power, port, internal transport, telecommunications and other public utilities required by major resource developments are commonly very large in relation to facilities generally available in the host country, and especially in the region of the project. Thus the standard of services is often improved considerably for communities and other economic enterprises in the vicinity of the major resource projects. The importance of these linkages depends on the exact location of the resource deposits in relation to population and alternative economic activities.

The major material inputs to the projects are commonly machinery and transport equipment, various manufactured goods and occasionally fuels. The sustenance of the work force requires some foodstuffs, and, together with building materials for construction, these are often the most important domestic supplies to major resource projects. The direct impact of the projects on opportunities for sales of foodstuffs and construction materials is often quite important in the vicinity of the project, but not in the national economy as a whole.

The relatively high cost of transporting raw materials usually provides economic incentives to make use of forward linkages in processing, although not when transport costs of the product exceed those for the raw material (petroleum), or where the need to dispose of by-products, tariffs in the countries in which the resource-intensive commodities are finally used, or other factors greatly increase the cost of trade in processed commodities (for example, smelting and refining of copper under some circumstances). The processing industries commonly share characteristics of large scale, technical complexity, limited local purchases of materials and capital-intensity with the mining operations themselves.

In general, the direct linkages are of lesser importance on a national scale in developing countries, although they can be important

to particular regions. Indirect effects through expenditure of rents generated by resource production are much more important.

4. Indirect Linkages: The Amount and Distribution of Resource Rents

By far the major impact of resource projects on developing economies occurs via the receipt and expenditure of resource rents by the Government or by the owners of domestic resources. This was not always the case, as colonial resource developments were often associated with very high corporate profits and small contributions to domestic revenues. The distribution of resource rents in developing countries seems to have been influenced considerably by the confident exercise of national sovereignty in recent years.

Each of the foreign and domestic factors of production has a supply price to a particular resource project. The rent that is generated in the process of exploiting a natural resource is the income that is earned after the deduction of the supply price of all domestic and foreign factors used within the production process, including factors supplied within the direct investment package.

The supply price of each factor is affected by the nature of competition within the relevant factor market. For ease of subsequent exposition, let us define the supply price of domestic factors of production as the price ruling in the economy at large, or such higher price as would apply in a competitive market. This definition allows us to speak of wage earners sharing in the "rent" generated by the resource project if their earnings exceed competitive or generally applicable levels.

It is useful to distinguish between potential rent, which would be generated through the use of the most efficient technology and business organization, and realized rent, which allows for the possibility that the profitability of a resource investment will be reduced through inefficient exploitation or use of the resource.

Potential rent may be dissipated in inefficient use of the resource, distributed amongst the various factors of production as

payments in excess of their supply price, or appropriated by the owner of the resource (which is usually the State) or by local or national governments which have veto powers over the exploitation of the resource. The distribution or dissipation of potential rent in these various ways determines the extent to which the resource projects allow higher levels of expenditure to be undertaken within the domestic economy. Rents accruing to foreign factors of production are generally lost to the domestic economy, although there may be some circumstances in which it is easier to induce the re-investment of profits generated within an economy than to induce new capital inflow. Rents accruing to domestic factors of production generally lead to increased expenditure within the domestic economy, as do rents accruing to government.

The payment of rents to domestic workers as wages above levels generally ruling in the economy can have important effects beyond the distribution of resource rents in some economies. Highly profitable mining operations are in a weak political position to resist wage claims, their capital intensity places them in a weak industrial position vis-a-vis their employees, and their commonly high profits give them relatively little incentive to resist such claims. It is common for wage levels in resource projects to be well above levels in other parts of the economy. High wages can contribute directly to excess supply of labor from rural areas in the mining towns. The high wages may spread to other regions through demonstration effects and considerations of equity, and lead to excess supply of labor in other urban areas.

The State is usually by far the major domestic recipient of resource rents, whether directly or through the earnings of national corporations. Both the total amount of rent and its distribution between the State and foreign investors are determined to a considerable degree by some rather technical matters of fiscal policy.

It is possible, in principle, for the State to impose financial conditions on access to natural resources which claim the rent for public revenues, without deterring any investment that would have occurred in the absence of conditions. This follows from the definition of rent. In the real world, where there is a high degree of

uncertainty about the possible outcomes of an investment, it is not possible to appropriate the whole of the rent from all resource projects without risking the deterrence of some investments that are capable of making some contribution to the national revenue. The amount of rent that can be taken by the State from profitable projects without deterring more marginal projects depends very much on the system of fiscal levies that is applied to resource investments. The effects of various fiscal policy systems are discussed later.

The supply price of direct investment is expressed in terms of the amount of profit after tax that is available for remittance to the owners of the investment. It is common for investors to require a project to meet a variety of explicit and implicit criteria on expected profitability before they are prepared to commit resources to it. For large resource investments, the most important single criterion is that the investment must generate positive expected net present value at the discount rate which the investor judges appropriate to apply to total cash flows associated with the project.

The rent generated by a project is higher the lower the supply price of private foreign investment. Thus it is higher the lower the discount rate applied by foreign investors to future cash flows from the project. It is also higher the lower the amount of capital which the private investor must place at risk.

Where the after-tax outcome of an investment is less certain (that it, where the variance of possible outcomes is greater), it is usual for the investor to apply a higher discount rate to future cash flows from the project. A higher expected return is required when there is greater risk. This aversion to risk is likely to be especially important in the case of investments where the absolute size of possible loss is very large, and therefore a threat to the financial standing of the parent company itself.

The discount rate that investors apply to anticipated cash flows associated with an investment is also a function of the opportunity cost to them of any funds that might be committed to the project. In a purely commercial situation in which the investor raises capital in

open markets, funds to all possible investments have similar opportunity cost. However, if funds are available for some investments but not for others, or if cheaper funds are available for some investments, the investor may apply a lower discount rate to projects for which the concessional finance is available. Thus the amount of rent from a natural resource may be increased by the provision of concessional funds for its exploitation by foreign governments.

There are other determinants of the supply price of investment, and so of the rent associated with the exploitation of a resource. One is the investor's assessment of sovereign risk, or the risk that the host government will change the rules that determine the amount of profit that accrues to private investors. The structure of the fiscal policy system is another: the variance of after-tax profits will be lower (and with it the discount rate applied by investors) the more fiscal charges are concentrated on profits which represent a high discounted-cash-flow return on investment.

Governments collect revenue from the rents generated by private investments in resource projects through a great variety of mechanisms: license fees; taxes on personal incomes of employees and on imports, and other charges on inputs into production; production sharing arrangements; royalties related to the volume of ore mined, its metal content or its value; export taxes; profits taxes of various kinds; withholding taxes on dividends and interest payments; and dividends from government equity purchased on concessional terms.

There are two distinct approaches to the setting of rent charges on resource investments. One approach is to establish a general system of fiscal policy including taxation rates within which all investors operate. It is possible that a general system which collected some revenue from intra-marginal projects would deter some investments, no matter how carefully it was designed. Similarly, a general system would not be able to extract all of the rent from every project, although a well-designed fiscal system could extract a high proportion of rents from profitable projects without losing large potential rents through deterrence of other investments. A more severe fiscal system

would claim for the revenue a higher proportion of rents from intra-marginal projects, but may reduce the total amount of rent that is generated from resource investments. A balance must be struck between these two factors in the implementation of a general system of fiscal levies.

The alternative approach is to tailor the system of fiscal charges to each project, through negotiations with the investor. If a government knew exactly how investors viewed future expenditures and income from each project, together with their attitudes to risk and the discount rates that they applied to cash flows anticipated in the future, it would be able to claim all of the rent from profitable projects without deterring any marginal investment.

The advantages of the former approach are that it provides a more certain environment for exploration, and that it protects the government from being exploited in negotiations through its own relative ignorance about parameters relevant to investment decisions. In practice, most governments choose to use a hybrid approach, in which the system of fiscal charges is negotiated within more or less clearly defined limits.

Whatever the approach adopted, the total amount of rent is affected by the nature of the levies by which the government obtains this revenue. Any charge applied in the early years of a project's life must be balanced by the relinquishment of claims to a greater amount of revenue in later years. The interaction of uncertainty about the outcome of investments with investors' aversion to risk means that more revenue can be collected if levies are applied to profits, and especially to profits which represent a high realized return on investment, than through charges on production or sales, or on profits which do not represent a high return on investment.³

In examining the effect of variations in the supply price of investment on government revenue, let us look first at the case where the government negotiates the fiscal system separately for each new project. If some external factor leads to a reduction in investors' discount rates, the government can claim for the revenue the whole of

the increase in rent from projects which were previously intra-marginal, provided only that it is fully aware of the change in the supply price of investment. In this situation, the government can also claim revenue from previously sub-marginal projects that are viable with the new, lower discount rate.

Where the government has established a system of fiscal levies that are applied in the same way to all investors, a reduction in the supply price of investment causes more investments to take place, and increases the revenue that the government receives from investments that had been undertaken at the old supply price of investment. The additional investments might include some that would have been undertaken at the old supply price of investment if no fiscal charges had been levied.

Beyond some scale of investment, corporations tend to apply a higher discount rate to future cash flows in the evaluation of a larger project, even where the variance of expected outcomes is identical to that associated with a more modest investment. This occurs because corporations are cautious about accepting the risk of very large losses. In this circumstance, both the government and the investor have an interest in establishing a consortium to share the risk. It is essentially for this reason -- to reduce the maximum size of the possible loss borne by each foreign investor -- that major resource investments in developing countries are now increasingly undertaken by consortia.

Private investors place especially high value on the government of the host country as a consortium member. In addition to the usual benefits of a consortium, it is commonly thought that government membership reduces sovereign risk.

For its part, the government, through participation in the consortium, can share in any untaxed rents that are allowed by the system of fiscal levies, earn the high return required by the private investor, and increase the total amount of rent through reduction of the supply price of private, foreign investment. The government can claim all or part of the additional rent through the negotiation of

concessional terms for its equity, or through the imposition of a more severe system of fiscal levies than would otherwise have been applied.

Infrastructure of various kinds usually represents a high proportion of the capital expenditure associated with the exploitation of natural resources in developing countries. When this infrastructure is provided by the private operators as part of the project, the project must be expected to generate sufficient after-tax profits to recoup the whole of the investment with interest equal to the investor's high discount rate.

There are circumstances in which the power, roads, port, town facilities, telecommunications and other infrastructure required by a resource development provide benefits to the general community, beyond the requirements of the project. These external benefits can justify some public contribution to ensure that private investors proceed with an investment that would otherwise be marginal. The supply price of investment is reduced by government provision of infrastructure. The high discount rate of private investors is applied to a smaller quantity of capital. In addition, the probability of absolute loss or very low return is reduced, so that the investors' discount rate is reduced.

When infrastructure is provided with public funds, the government may choose to charge for its use at a rate which recoups its costs, perhaps with some profit. Alternatively, the government may choose to rely entirely on its share of the increased rent to recoup its outlays. If no fee is charged for the infrastructure, it is possible for the government to suffer an absolute loss through the development of the resource, or a net loss through the provision of infrastructure. If a user charge is set at a rate designed to recoup the government's outlays on infrastructure with interest equal to its own discount rate there is little chance of net loss. In the latter case, the amount of rent will be raised above the level associated with the investor's provision of infrastructure, provided only that the government's discount rate is less than that of the private investor.⁴

When a government's financial relationship to a resource project is simply that of a taxing authority, it runs no risk of absolute loss.

Where it purchases equity at a commercial price, it runs the same risk of absolute loss as the private investor and, as the taxing authority, stands to gain proportionately more than the private investor from a successful outcome. However, a government is wise to be very much more wary about the provision of infrastructure without economic user charges. In the latter case, the government must make its own assessment of the likelihood that returns from the project will be too small to cover its outlays, in an environment in which the private investor has a positive incentive to obscure from the government some aspects of the financial realities of the project.

Of course, the amount of the absolute loss that might be incurred by the government, and the amount of additional revenue that must be raised as a consequence of the provision of infrastructure for this expenditure to be worthwhile, are less the lower the opportunity cost to the government of funds used for this purpose. There are many mechanisms through which foreign governments and international agencies make funds available on concessional terms to resource investments in developing countries. The immediate effect of the provision of funds through these mechanisms is generally to reduce the supply price of investment directly, or to reduce the opportunity cost to host governments of funds allocated to resource developments.

Although the provision of finance to resource projects appears to raise the amount of rent available to host governments from each individual project, on a global scale such practice may possibly raise or lower the total amount of rents available to the governments of resource-exporting countries, depending on the effects of these measures in increasing world supply and reducing world prices of resource-intensive commodities. It should be noted that the extent to which official foreign financial assistance increases resource rents received by host governments depends on the extent to which it is available in support of intramarginal projects (rather than investments which would be sub-marginal in the absence of assistance), on the extent to which funds are tied to specific uses and sources of supply and on the effectiveness of the administrative systems through which

aid is received in the host country.⁵ It is possible for such assistance to provide negative net benefits for a recipient when it leads to the inefficient use of a resource, when the recipient government's financial commitments to a project exceed the concessional element in the foreign funding and the shortfall cannot be recovered as increased yields from fiscal levies, or when the receipt of tied, specific purpose aid for resource investments lowers the quality or reduces the quantity of aid for other purposes.

5. Macroeconomic Impact

Resource investments expand the maximum level of real expenditure that is sustainable within the domestic economy. This expansion in real spending power has important effects on the balance of payments, the labor market, and the profitability and scale of activity in other industries.

These important effects have been widely discussed but poorly understood within the Western Pacific region. Some advisers and commentators on the Indonesian economy have felt that the strong growth in oil revenues has caused the foreign exchange value of the Indonesian rupiah to remain "too high," and that this has caused an increase in the level of unemployment. Very similar propositions have been argued seriously in Australia. However, resource investments give rise to adverse effects on the main macroeconomic aggregates only in rather special circumstances, involving rigidities in patterns of domestic expenditure and in labor markets, and difficulties in implementing stabilizing fiscal and monetary policies.

The balance of payments is affected by resource investments to the extent that adjustments to real expenditure fall short of, or exceed, the increase in real spending power. In the construction phase of resource investments, the increase in real spending power comes via the capital inflow. Once production has commenced, it comes via the export income, less payments overseas to foreign factors of production. It appears as increased incomes of various individuals and groups in the

domestic economy (including the government), plus increased cash balances held by foreigners within the domestic monetary system. The behavior of the government, usually the principal recipient of resource rents, is crucial in determining whether the increase in expenditure (absorption) falls short of, equals, or exceeds the increased spending power of the economy, and so whether the balance of payments impact is positive, neutral or negative. There is a reasonable presumption that the increase in real spending power within the domestic economy will allow governments to meet demands for public expenditure more easily without recourse to fiscal policies which lead to payments deficits. However, this may not be the case if public expenditure becomes geared to expectations of revenue that are eventually disappointed -- a situation covered in the later discussion of instability.

Domestic expenditure rises in the construction phase of resource investments principally as a result of work on the project itself, possibly augmented by increased government expenditure from the expansion of revenues associated with the increase in economic activity. After the commencement of production and export, real expenditure is raised by the spending of increased incomes flowing from the project (or indirectly by expansion of bank credit that has its origins in the increased incomes).

The increased expenditure raises demand for the products of established and potential local industries, as in the "resource trade" models. The impact of increased domestic expenditure on the profitability of industries outside the resource sector depends on the combined effects of scale economies and of possible increases in domestic resource costs, and especially of domestic labor costs.

To commence analysis of labor market effects, let us assume that domestic labor is a homogeneous resource. We need to distinguish three separate cases of labor market conditions. Case 1 is the dual economy comprising a village and a modern sector, within which the supply of labor to the modern sector is infinitely elastic. This is the case assumed in the Lewis and subsequent models of the surplus labor

economy. Case 2 is the dual economy within which the village sector is highly differentiated, having a positive opportunity cost which varies considerably across villages and regions. More labor can always be induced to migrate from the villages to the modern sector, but only by raising the expected level of modern sector incomes. Case 3 is the fully monetized economy, in which the supply of wage labor is fixed more or less independently of labor market conditions. These highly stylized cases do not fit any economy exactly, but the three cases have something in common with conditions in Indonesia, Papua New Guinea and Australia respectively.

The effects of an expansion in aggregate demand on the domestic economy depend very much on whether wages are set in the market so as to equate the supply of and demand for labor, or whether minimum wages are established institutionally.

When wages are set in the labor market, increased domestic expenditure raises the real wage level in Cases 2 and 3, but not Case 1. It induces migration from villages to the modern sector of the economy in Cases 1 and 2, but there is no opportunity for such an expansion of modern sector labor supply in Case 3. There is no unemployment in any of the three cases.

In the alternative situation where institutionally set minimum wages constrain the cleaning of the labor market, increased aggregate demand induces migration to the modern sector in Case 1, but does not affect permanently the wage level or the rate of unemployment. In Case 2, increased expenditure induces some additional migration to the modern sector (because of the increased probability that a migrant will find employment), but also reduces the rate of modern sector unemployment. In Case 3, there is an even greater reduction in unemployment, because there is no increase in total labor supply to the modern sector. In Cases 2 and 3, it is possible that the increased expenditure will lead to the elimination of unemployment and to an increase in real wages in the marketplace beyond the institutionally-determined minimum levels.

Increased aggregate demand only reduces modern sector unemployment to the extent that there is no offsetting increase in minimum wage levels. The feeling of prosperity that accompanies the increase in national spending power creates an environment within which wage-setting institutions are more likely than usual to be sympathetic to large wage increases, for reasons of "equity," or in accession to pressure from wage-earners. This is an important possibility, as evidenced by the recent experience of Thailand, Australia and Papua New Guinea, where minimum wages were raised considerably through the boom period 1972-74. But it is not an inevitable consequence of boom conditions in the export industries, as evidenced by the substantial decline in real minimum wages in the Philippines over the same period.

Of course, labor is not homogeneous in any economy. Even in the dual economy in which the general supply of labor to the modern sector is infinitely elastic, the scarcities of some skills will increase average labor costs to some extent, at least temporarily. There will be opportunities for firms and governments to eliminate scarcities of particular skills over time, through training and through the accretion of skills "on the job."

The changes in domestic labor costs, discussed above, and the relationship between scale of output and unit costs in various industries, together determine the effect of increased expenditure on prices and the sectoral composition of economic activity. Let us trace through the effects on the assumption that the foreign exchange value of the domestic currency is fixed.

Total demand for modern, non-traded goods rises with increased aggregate demand, the more so since the income elasticity of services tends to be high. Economies of scale are relatively unimportant in these industries, except perhaps in very small and underdeveloped economies. The price of non-traded goods is thus likely to rise with the increased cost of domestic labor in (unconstrained labor market) Cases 2 and 3. The general price level rises with the price of non-tradeables. In all cases, output of modern non-traded goods and services is likely to expand, and with it employment in that sector.

The increase in wages in (unconstrained labor market) Cases 2 and 3 may cause continued production to be unprofitable in some established export- and import-competing industries in which economies of scale are relatively unimportant over the relevant range of output. There is no similar tendency towards contraction of some established industries in (unconstrained labor market) Case 1, or in (constrained labor market) Cases 1, 2, or 3.

The increase in demand is likely to cause investment to be profitable for the first time in some industries in which economies of scale are important. This effect will be most important where there is no increase in the wage level ((unconstrained labor market) Case 3).

The overall impact of the increase in expenditure on sectoral economic activity and employment is as follows. Output and employment in the modern, non-tradeables sector rises in all cases. Village population falls in all variations of Cases 1 and 2; village production of goods and services falls in all variations of Case 2, and probably also in Case 1, although not if the labor of migrants had been unemployed in the village. Activity and employment in the modern, tradeables sector rises within some industries and falls within others. Total output and employment in the modern, tradeables sector rises in (unconstrained and constrained labor market) Case 1, (constrained labor market) Case 2, and (constrained labor market) Case 3. Employment (and possibly output) in the modern, tradeables sector falls in (unconstrained labor market) Case 3, and may rise or fall in (unconstrained labor market) Case 2.

There may be some contraction of employment and output in the modern, tradeables sector if the "resources boom" induces increases in the institutionally set minimum wage, even in Case 1, which would otherwise be immune from contraction of employment in any part of the modern sector.

Apart from the special problem of instability, discussed later, the macroeconomic "problems" that are thought to be associated with major resource investments derive from the inflationary effect that is felt in (unconstrained labor market) Cases 2 and 3, and from the major

shifts in the sectoral and industrial composition of economic activity, and especially from the decline in profitability and employment in some established industries within the modern, tradeables sector. The inflationary effects could be offset by raising the foreign exchange value of domestic currency. The associated fall in the price of tradeables could lead to an increase in the price of labor (and non-tradeable goods and services) relative to tradeables without an increase in the general price level. However, currency revaluation in these circumstances carries the political disadvantage that resources appear to be "pushed" out of the declining industries by government policy action, rather than "pulled" out by superior opportunities elsewhere in the economy.⁶ This factor may be thought to outweigh the political advantages of avoiding inflation in some political system.

Structural adjustment, involving reduced profitability and possibly reduced output in some established industries, is often seen as a problem by governments, which may seek to suppress the expansion of expenditure that would otherwise occur within the domestic economy through increasingly restrictive fiscal and monetary policy. If successful, such measures channel the increased real spending power associated with resource investments into higher net domestic holdings of foreign assets. This consequence may be desirable in countries whose reserve and foreign debt position had previously been weak (for example, Indonesia through the 1970s), but it is not desirable, and in many cases not sustainable for very long, in other countries. The sterilization of external payments surpluses associated with resource investments through budget surpluses is easier to achieve in a small economy in which the government is the main recipient of resource rents, but its continuation involves the loss of opportunities for development and domestic incomes growth. In larger and more complex economies, where the growth in incomes associated with resource investments is spread more widely through the economy, sterilization of payments surpluses through tight fiscal and monetary policy involves considerable redistribution of income and access to credit, which is resisted politically by groups which stand to lose from

continuation of such policies. The degree of restriction in fiscal and monetary policy -- and the amount of income redistribution -- must be increased if continuing payments surpluses and tight monetary conditions induce capital inflow. It is very likely that the resistance to sterilization will force its abandonment through revaluation or, in the more common case, an inflationary adjustment that is the more traumatic for having been postponed. This was the Australian experience through the early 1970s.

Microeconomic measures to resist structural adjustment may be more successful but, like successful sterilization strategies at the macro level, they squander opportunities for development and increased incomes. As at the macroeconomic level, the effects of particular measures to assist industries which have been hurt by increased domestic incomes depend on labor market conditions. Let us examine the limiting case of successful protection of earlier levels of production, employment and profitability in all modern, tradeables industries. In Case 3, all rents would be dissipated as subsidies and the establishment of resource projects themselves would be frustrated. In Case 2, protection of threatened industries would dissipate some but probably not all of the rent.

Changes in the industrial composition of economic activity generate frictional and structural unemployment, and this is an inevitable accompaniment of rapid growth in exports of resource-based commodities. But resource investments do not contribute directly in any way to tendencies towards increased unemployment in some circumstances; and where they lead directly to the decline in employment in some industries, this effect follows from increased tightness in modern sector labor markets. However, subsequent government intervention in raising minimum wage levels may be a proximate cause of increased unemployment of a general and more permanent kind. These problems as well as problems of structural and frictional unemployment are greater in unstable economic conditions.

6. Macroeconomic Instability

As discussed above, two different types of instability are associated with heavy reliance on exports of resource-intensive commodities. First, investment proceeds in large steps, giving rise to an uneven rate of growth in productive capacity. Second, exports and incomes from established projects vary cyclically with world market conditions. Each gives rise to problems for domestic economic management.

The capacity to implement programs of public expenditure efficiently grows incrementally. Private sector expenditure patterns reveal similar if less obvious characteristics. There is thus a considerable risk that large increases in public expenditure associated with the stepwise growth in revenue from resource rents will be used wastefully. This can have a corrosive effect on the development effort beyond the purely economic loss involved in the wasteful use of financial resources. The dissipation of part of the sudden large increase in Indonesian oil revenues through the 1970s provides the most dramatic example of this phenomenon in the Western Pacific region.

Cyclical variations in expenditure that can be associated with cyclical variations in the volume or value of exports present different kinds of problems. Any substantial fall in total domestic expenditure may threaten the viability of new industries established on the basis of scale economies that are only available at peak levels of demand. It is possible for this to give rise to a process of cumulative decline in economic activity. These dangers are less if there is a high underlying rate of "neo-classical" growth. They are also less important in a large economy in which economies of scale are critically important at the margin to a smaller proportion of domestic production of tradeables.

Cyclical variations in expenditure have even more important effects through the labor market. Real wage levels that appear to be

justified at the height of domestic expenditure are too high for full employment to be maintained when the value of resource exports is cyclically low. Wages are commonly (although not universally) rigid downwards, so that a large reduction in real expenditure can lead to intractable unemployment. Several countries in the Western Pacific region have experienced problems of this nature in recent years.

Large fluctuations in the volume of aggregate demand also contribute to uncertainty in investment decisions (and so to increases in the supply price of investment) and to frictional and structural unemployment.

Problems associated both with the stepwise increase in productive capacity and with the cyclical variation in demand can be managed if governments set fiscal and monetary instruments so as to place total expenditure on a path of growth that is sustainable through the resource investment cycle and the external business cycle. This involves accurately assessing long-term trends in international markets and their effects on domestic spending power, setting policy instruments accurately to produce desired levels of expenditure growth, and enforcing these policy settings through periods in which official, net foreign assets are rising strongly, against the inevitable political pressures to spend up to short-term limits. Each of these three elements of successful stabilization strategy is difficult. If the government succeeds in maintaining aggregate expenditure on a path of more or less steady growth, there will inevitably be some variation in the components of total expenditure.

Domestic economic management along the lines described in the preceding paragraph can insulate the domestic economy from much of the effect of variation in external demand. But stabilization strategies must be based on some concept of "average" conditions, and are likely to be upset by market developments that are outside the reasonably foreseeable range of possibilities. There was nothing in the postwar world economy's experience to suggest that a dislocation in world demand for some non-ferrous metals could be as severe or enduring as that which has been experienced over recent years. Individual national

governments can do little to avoid economic problems associated with unprecedented behavior in markets for minerals and metals.

7. Longer-term Effects on Growth

Resource investments raise the maximum level of expenditure that can be sustained within the domestic economy. Expenditure of resource rents raises incomes, economic activity and modern sector employment. The composition of the increased expenditure determines its subsequent effects on development within the economy as a whole.

Analysis of the composition of expenditure takes us into general questions of public finance, development planning and development administration that have little special relationship to resource investments. We have already noted that instability makes it more difficult to use increases in spending power that derive from resource investments effectively. Good domestic management can reduce greatly but not eliminate these difficulties.

There is a second major connection between the effectiveness with which increased spending power is used, and its origins in resource investments. The resource rents accrue mainly to governments in the first instance. They are thus available for distribution according to government priorities, without the political and administrative difficulties and without the allocative distortions that are commonly associated with other means of raising government revenue.

The initial concentration of increased income in the hands of the government carries potentially important advantages. The advantages are greatest in countries with limited infrastructure and in which public investment can be expected to yield very high social returns, but within which it is not easy to greatly increase public revenues by other means. Indonesia and Papua New Guinea provide good examples of such countries within the Western Pacific region. Alternatively, if a government judges that social returns are higher on private than on public investment, it can reduce taxation or make funds available to the private sector in other ways. If it judges that funds are best

used within the public sector, but invested in directly productive enterprises, it can make part of its share of the rents available to a state corporation for investment (as was the Indonesian pattern before Pertamina's financial collapse in 1976).

But these are potential benefits that can be realized only through wise, honest and efficient administration. The availability of large resource rents places a premium on these qualities of good government.

8. Income Distribution

The heavy regional concentration of resource investments, and the tendency for direct linkages to be concentrated in the immediate vicinity of the mine, generate enclaves of high incomes and high standards of services. Where a mine is established in a previously poor region, it may eliminate and reverse earlier patterns of inter-regional inequality. The new, inter-regional inequalities are exacerbated to the extent that local communities and a local or provincial tier of government can successfully claim a significant part of the rents generated by a project, as is possible through legal or political processes in many countries. They can be mitigated by large-scale migration of labor from more distant parts of the country.

The macroeconomic impact of resource projects, in raising the maximum wage level that is consistent with full employment in urban labor markets, or in reducing unemployment, tends to reduce inequality in the distribution of incomes in the country as a whole. However, this is not the case, and the opposite may be the case, if a changed industrial relations environment following major resource investments leads to large wage increases and increased unemployment.

Provided that the national government receives the greater part of rents, as is usually the case, it has a greatly increased capacity to promote development in poor regions and redress inequalities in many ways. National governments also have considerable influence over changes in the wage level following expansion of resource investments, and over the inter-regional inequalities associated with projects'

direct linkages.

Major resource developments can be important aids in implementing programs aimed at reducing inequalities in the distribution of benefits and services. But as with the long-term growth effects, much hangs on the wisdom, effectiveness and honesty of national governments. A corrupt government, or one that is vulnerable to pressures from urban and other privileged groups, is likely to use much of its increased spending power in ways that exacerbate existing income inequalities.

9. Domestic and International Policy

We began the discussion of the role of natural resource investments in the development process by examining briefly the "resource trade" models of trade and development. These models describe a number of characteristics of growth based on the export of natural resources, but indicate that the precise impact of resource exports depends very much on the nature of the particular linkages with the domestic economy, which vary from industry to industry and economy to economy.

A brief examination of the characteristics of major minerals and energy investments in the Western Pacific region suggested that the most important linkages were via expenditure of resource rents. The amount and distribution of these rents depends very much on the system of fiscal levies that are applied to resource projects. The government is the principal recipient of resource rents within the domestic economy of the host country.

The developmental impact of resource investments depends critically on the effectiveness of national governments in identifying and taxing resource rents, and in using the rents in ways that contribute to attainment of various national objectives. Resource investments can promote incomes growth and reduction in inequalities in the distribution of incomes and services, two major stated objectives of almost all governments. But the existence of a strong administrative apparatus for managing both the resource investments themselves and

public expenditure is a precondition for the realization of this potential.

The government of a resource-exporting developing country is more likely to succeed in using well the potential for development inherent in opportunities for resource trade if there is stable expansion in the world economy as a whole, and especially in large, proximate industrial countries. There is no new lesson in this, and the industrial countries in their own interests are seeking to achieve more stable growth. But given that there will continue to be major fluctuations in world industrial activity, can the international community do anything to reduce the impact of this instability on the resource-exporting developing countries?

Instability in markets for resource-intensive commodities creates the largest problems in exporting countries, but the industrial countries share an interest in stable commodity prices. Private speculation does not have a sufficiently large stabilization effect, because the financial resources available are too small and because private expectations about future market conditions are subject to large shifts in line with the general climate of optimism about future industrial growth. In addition, the national and international benefits of commodity price stability are not internalized in the rewards of successful, private speculation, so that we can expect a less than optimal amount of resources to be provided to these activities.

There is thus a case for public financing of stocks in an attempt to stabilize prices and, since many countries gain from more stable prices, for international cooperation in the stabilization exercise. This is the logical basis for attempts in recent years to establish international buffer stocks of various commodities, and to develop countries' demands for a "Common Fund" to finance the holding of stocks. The Fund would need to be very large indeed to be effective in stabilizing prices, and there would be very large costs in terms of eventual market dislocation if attempts were made to stabilize prices at levels that were not sustainable in the long term. The "Common Fund" would need to be well conceived and very large to provide

important beneficial effects. Short of such large-scale international efforts, it would seem to be sensible for governments of individual industrial countries to finance the holding of stocks on a large scale in times of weak demand. This would be least costly for each country when the weak demand coincided with tendencies towards surplus in external payments, as in Japan and West Germany at the present time.

The main problems created for developing countries by instability in resource markets could be eliminated through international arrangements which guaranteed government revenue against fluctuations in export prices. Governments in developing countries could be invited to plan future expenditure on the basis of reasonable expectations of revenues from resource investments in "average" conditions, along the lines of the Papua New Guinea approach in the Mineral Resources Stabilization Fund.⁷ Loans, repayable only in the event of market prices later exceeding agreed expectations of "average" levels, could be made available to developing countries on a bilateral or multilateral basis when revenues fell below "average" levels. The International Monetary Fund's Compensatory Finance Facility has some of the required characteristics, although the scale of its activities is too small to be of major importance. This approach also has much in common with the "Stabex" arrangements of the European Economic Community, and with requests of Japan made by ASEAN countries in 1977. It makes fewer demands on financial resources than successful buffer stock arrangements, and by avoiding direct intervention in commodity markets it avoids the risk of future dislocation associated with attempts to stabilize prices at unrealistic levels.

International cooperation could assist the governments of developing countries in turning endowments of natural resources into broadly-based development. But the most important determinant of the effects of resource exports on development will continue to be the performance of those governments themselves.

FOOTNOTES

¹Richard E. Caves, "'Vent for Surplus' Models of Trade and Growth," Trade Growth and the Balance of Payments, Essays in Honor of Gottfried Haberler, Rand, McNally and Co., Chicago, 1965.

²Ironically, news of the I.R.S. ruling came to the Western Pacific region at about the same time that Secretary of State Kissinger was endorsing the production sharing concept at the Nairobi meeting of UNCTAD. Subsequent IRS rulings, however, may have resolved this conflict.

³These issues are discussed and an optimal system of resource taxation is suggested in Ross Garnaut & Anthony Clunies Ross, "Uncertainty, Risk Aversion and the Taxing of Natural Resource Projects," Economic Journal, 85, (June 1975), pp. 272-287; and the same authors in, "The Neutrality of Taxes on Resource Rents" (unpublished paper).

⁴This is the usual case (if only because the government does not need to discount for sovereign risk) whenever governments have some access to international capital markets (which is also the usual case).

⁵These issues are discussed in Ross Garnaut, "Aid, Natural Resources and Development," paper delivered to the Development Studies Centre, Australian National University, Canberra, 15 June 1977.

⁶This asymmetry between political responses to revaluation and increases in the domestic price level has been pointed out by Richard Snape in a paper to the University of New South Wales workshop on exchange rates, Sydney, 1977.

⁷The Papua New Guinea Mineral Resources Stabilization Fund was discussed at some length at the Seventh Pacific Trade and Development Conference in Auckland in 1975.

RESOURCE TRADE AND THE DEVELOPMENT PROCESS IN DEVELOPING COUNTRIES
A COMMENT

Kuo-shu Liang

Garnaut's fine paper seeks to identify the nature of opportunities and problems associated with the resource trade and development process in developing countries. The analysis is, in an abstract way, aimed at understanding fundamentals. I am very happy to have an opportunity to comment on this fine paper. My brief comments will focus on the following points:

(1) Garnaut began his discussion of the role of natural resource investments in the development process by examining briefly the "vent-for-surplus" model of trade and development. This model is an interesting tool for the analysis of the "opening up" phase of trade development,¹ but the mineral sector may, by its nature, become very export-oriented. The effects of production-function differences may emerge as an important determinant of development patterns, by comparing a development which specializes in export-oriented, labor-intensive manufacturers with one of mineral industry projects which are very capital-intensive and require enormous infrastructures. Much greater investigation of country experiences may be required so as to understand more fully the effects of production-function differences which may have to be carefully considered in the formulation of plans for further development.

(2) As pointed out by Garnaut, substantial benefits can accrue to a country from properly structured and administered mineral industry projects. Mining activity provides additional public and private revenues, furnishes foreign-exchange earnings, stimulates development of infrastructures, and improves the professional and technical skills of nationals. However, there is no doubt that the development of the mineral industry can also have adverse effects on the economy of

developing countries. Demand for industrial raw materials varies more than industrial production. Changes in the general expectation of industrial growth and price trend can cause speculation to be destabilizing. Mineral-export projects have also remained enclaves in many cases, better integrated with the outside world than with the host economies, and have allowed few backward linkages. Even though Garnaut points out that indirect effects through expenditures of rents generated by resource production are much more important than the direct linkages, he also correctly realizes that much hangs on the wisdom, effectiveness, and honesty of the national government. It seems to me that the problems of export-induced internal instability need more careful investigation. Developing countries may be more vulnerable to export fluctuations because of their limited capacity to deal with disturbances generated by export instability. Even prospects for any kind of international endeavor, whether by exporters, importers, or both, are far less predictable.²

(3) With attendant risk and capital requirements in the mining industry much higher than for other industries, an industry structure has been created which is dominated by international corporate giants that are sophisticated in finance and technological information. With the changing role played by these giant corporations, and in order to open up new opportunities for cooperation in joint ventures, it seems to me that, from a long-term growth standpoint, it is particularly important to provide a framework of fairly predictable rules -- especially a predictable tax structure of the fiscal policy system -- by which the investment decisions are to be made. The precise relation between the multinational corporations or joint ventures and the host country has to be clearly defined. Governments must respect its agreement, and companies, on their part, must show increased concern in their economic contribution to the country in which they operate. Their role has to go beyond the traditional objective of maximizing company profits.

(4) Regarding mineral processing, both scale economies and costs of capital investment have to be carefully taken into account. Since

forward linkage into fabricating minerals is not so reliable as backward linkage, market opportunities become very important. With excess capacity now existing in developed countries, I do not think that developing countries should carry on mineral processing projects at this time. New firms in developing countries will face very keen competition from established firms in developed countries which may price at their marginal costs.

FOOTNOTES

¹R. Findlay, Trade and Specialization (Baltimore: Penguin Books, 1970), p. 76.

²S. Krasner, "The Quest for Stability: Structuring the International Commodities Markets," in G. Garvey and L.A. Garvey, International Resource Flows (Lexington, Mass.: Lexington Books, 1977), p. 54.

RESOURCE TRADE AND THE DEVELOPMENT PROCESS IN DEVELOPING COUNTRIES

A COMMENT

Anthony Scott

Garnaut's paper reveals his wide familiarity with the options open to host countries whose minerals and other durable natural resources have attracted offers from raw-material-hungry firms and countries. In view of the smallness of the domestic markets in host countries, and the enormous concentrations available for production and sale, he rightly bases his analysis on Richard Caves' well-known vent-for-surplus model, modifying it for the different conditions in different economies. Other writers have of course noticed the appropriateness of this model. Harold Innis and Douglas North made much of the approach to explain the whole "staple" or "export-orientation" of early North American settlement and development. The later Spengler volume on natural resources and growth contains several useful global applications, not the least those by Adler and Kindleberger.

As Garnaut makes clear, the problem does not lie in applying the staples (i.e., vent-for-surplus) approach to explain the life-history of the export industry itself; the model fits very well. Nor is there any difficulty in tracing the backward linkage from the resource industry to the supplying industries and activities that it engenders. Garnaut can be brief on this subject because so much has already been done by other writers.

I was surprised that after a fairly long list of types of backward linkage, Garnaut concluded that they were of "limited importance." This conclusion may have emerged because the backward linkages are not for current inputs so much as for capital goods, structures and infrastructures. Unfortunately these important durable inputs do not often show up on input-output tables, and are therefore forgotten or written off. There is some evidence that Garnaut is not interested in

the employment created by the construction complementary to the resource project.

Apart from this parenthetically-mentioned problem, Garnaut makes it clear that the real challenge of the staple approach to development is in what he calls "indirect linkage," referring to the capture of a share of the rent from the foreign developer; in the instability of this revenue; and in the labor market ratchet effects. Surprisingly little is said about forward linkages. In many resource-export regions these are created by requiring that the developing industry establish refineries and other plants to process the raw materials on the spot.

I am particularly impressed with the thorough examination of modes of taxation (indirect linkage) and of macroeconomic instability. These authoritative sections, which extend the previous Garnaut-Ross advocacy of a Resource Rent Tax, applied to profits rather than to output. This system is very like the "stumpage" or "Crown dues" system of pricing already used in taxing the use of publicly-owned timber, and has recently been applied (as a "net-royalty") to the newly-developed coal resources of Alberta, and doubtless to many other resources and locations. In one way or another, this subject is blended with Garnaut's concern about the domestic inflationary effects of resource booms. The inflation is expressed in terms of the foreign value of the domestic currency. At various points Garnaut seems to be leading up to a suggestion that the Resource Rent Tax could itself become a means of sterilization and wage control, but I do not think that this point is fully made.

I wish to draw attention to what I believe is a major omission in Garnaut's exposition. As an expert on mining taxation and tenure, Garnaut must be aware of the fact that most minerals occur in a Ricardian array of grades, so that prolonged mining runs into higher costs; and that most mineral sites are eventually exhaustible, no matter how low the cut-off grade that is chosen. How do these facts modify the approach of the paper?

First, the staple or Caves approach is not fully applicable because the discovery and opening-up of a new resource site will

eventually be followed by its decline and closure. I have dealt with this problem in my "declining regions" application of the staples approach (1965). This is no curiosity. It makes the somewhat academic division of types of labor force suggested by the author inadequate to deal with the cycle of labor force problems that accompany mineral development. Garnaut may hope that something else will come along after the mineral is all removed; but as Welsh and Appalachian coal suggests, this does not usually happen.

Second, Garnaut's paper seems to me to be based on the assumption that the costs and productivity of mines are fixed. In reality they rise as the amount removed accumulates, and fall with new local discoveries of extensions or of technologies that are locally applicable. Thus mines may open and close in a fashion that Caves (dealing mostly with agriculture) did not fully realize. Garnaut is correct, for example, in pointing out that -- as transport costs change -- whole resource regions may be admitted to, or shut off from, world trade. What he omits is that this process may not be monotonic. Regions may be opened up, abandoned, rediscovered, and so forth, many times. Placer gold and tin, coal and peat, bedded minerals, and most metals illustrate this theme. Today's played-out region is tomorrow's new play.

Third, and more serious, Garnaut seems always to take the proposed rate of production as given. It is important to recognize that in the mineral world the rate of production impinges on fixed mineral reserves and so increases inversely with the life of a mine. Consider the following itemized list of connections between Garnaut's subjects and the life of the mine.

1. A true net tax on mineral profits probably has no effect on the investor's planned life of his mine; but the Garnaut-Ross scheme is not exactly neutral in this sense.

2. The impact of the mine on the labor market can be minimized by specifying by law or contract that the mine must be exploited at a certain slow rate. This may cut the cash profits and the financial revenues to the government, but it will also reduce the social cost of overly rapid labor immigration, followed by early unemployment as the mineral is exhausted.

3. Government provision of infrastructure makes labor less expensive, increases the privately planned rate of mining, and shortens the life of the mine.

4. Rapid mining wastes specialized infrastructure at both the "boom-town" and "ghost-town" ends of the life of the deposit.

5. High rates of interest, that deter structural investment, also increase the opportunity cost of holding minerals in the ground and so may result in increased (not decreased) rates of investment.

6. High taxes, high labor costs, and the absence of infrastructure, may lead to the postponing of production, but they do not lead to the destruction of the resource. If the "user cost" of the mineral is rising faster than the domestic demand for revenues, the economy may gain, not lose, from delaying going into production. In particular, it may be worthwhile to skim the cream and leave the rest for better markets.

Finally, Garnaut's paper suggests that all mining and raw-material extraction is capital intensive. It certainly may look that way, especially in developing countries, where capital is otherwise very scarce. But in general, mining can vary in its capital intensity, as can manufacturing and the service industries. Furthermore, there is general agreement that the resource industries in general pass through phases, of which the high-capital intensity phase is not the final one. It is possible that new technologies will encourage small establishments and short transportation routes rather than massive investment. I have examined some of these possibilities in my 1962 paper; the work of Nathan Rosenberg and of John U. Nef points the same way.

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RESOURCE TRADE AND THE DEVELOPMENT PROCESS IN DEVELOPING COUNTRIES
GENERAL DISCUSSION

Garnaut agreed with Liang that the internal impacts of export instability created an important policy problem, but noted that a detailed discussion of it was outside the general scope of his survey. He further pointed out two offsetting influences on the exposure of LDCs to export instability. On the one hand, LDCs were generally heavily specialized in a few exports, but, on the other hand, macro-economic adjustment policies may be more effective than in developed countries, due to greater real wage flexibility and other factors. A recent Brookings study on economic stability was cited in support of the latter point. Garnaut also agreed that an environment of well-defined government rules was important for the investment decisions of multinationals, but thought that other types of investment uncertainty were more important. He further noted that incremental processing capacity probably would shift to developing countries more efficiently located, as evidenced, by the relocation of Japanese non-ferrous metal industry capacity.

In response to Scott, Garnaut said that his point was not that direct linkages were unimportant, but rather were relatively unimportant compared to indirect linkages. Variation in a special resource rent tax would not in itself be important for stabilization since corporate expenditures in the resource industry were more related to expected future profits than current profits. In addition, disposition of government rents is more important than the disposition of corporate rents. The domestic effects of possible exhaustion were ignored because this was not an immediate problem in the Pacific Region, although it may be in the long term.

In some countries, such as Chile, the resource industry consists largely of domestic private firms, rather than foreign or government enterprises. For such countries price instability may induce

potentially inefficient conglomeration for purposes of diversification, which points to the need for more developed capital markets in LDCs to provide diversification opportunities. Garnaut agreed that inefficient capital markets could lead to underinvestment in resource industries.

Considerable controversy arose over whether tax on rent would have neutral allocative effects. One participant asserted that a rent tax will always affect the long-term level output. Corresponding to an array of investment opportunities is a distribution of rents, and the pattern of investment depends on the ordering of the distribution. Unless a tax is applied evenly across investment projects, a rent tax will change the ranking of investment opportunities. It was pointed out that if international capital markets were perfect, and if taxable rent was exclusive of minimum return necessary to induce investment, then a rent tax would be allocatively neutral. But if capital markets were imperfect, so that loanable funds were inelastic, then a rent tax would influence the allocation of loanable funds. Garnaut insisted that if the correct discount rate were incorporated, a tax on pure rent would be allocatively neutral regardless of capital market conditions.

There was a related discussion on the appropriate definition of rent. It was agreed that it should exclude essential costs of production as well as minimally required risk premia.

Some discussion also focused on the ethical question of the distribution of rent. One participant contended that there should be no presumption that taxing away of rent was either necessary or desirable. Distribution of economic rent between profits and wages may have efficiency benefits, including less unemployment. However, Garnaut noted that higher wages in a resource industry could have negative spillover effects on other segments of the economy. A counter ethical argument was that resources were a commonly shared natural endowment. Rent in excess of normal returns to risk taking should be equitably distributed. It was pointed out that, empirically, the body-politic concurs that a general distribution of benefits is more desirable. Finally, someone half-facetiously suggested that the

common heritage argument implied that benefits should be distributed across the world community rather than a national community.

A participant felt the paper should have discussed the structural changes resulting from expenditures of the government surplus from running operations, and their implications for development, and that it might be useful to analyze such structural change within subclasses of LDC experience. Garnaut countered that the pattern of government expenditures was generally unrelated to revenue sources, and so was not directly relevant to a discussion of resource-based development.

Another participant remarked that the case for public financing of commodity stocks to stabilize prices was not obvious, since it was not known how such a scheme would actually work, nor whether increased government intervention in markets might be self-defeating. Garnaut agreed on the latter point, particularly if market clearing prices were incorrectly assessed. He thought the least danger for market dislocations lay in schemes for stabilizing revenues of host countries.

OCEAN MINING IN THE PACIFIC BASIN: STIMULUS AND RESPONSE

Michael Gorham*

1. Introduction

There are scarce mineral resources resting upon the ocean floor outside the domain of any nation state.** There are a number of countries who would like to control the allocation of these resources and these countries can be divided into three basic categories: those who want to directly exploit the resources; those who want to prevent, or at least delay or slow down, the exploitation; and those who simply want to share directly in the benefits of exploitation.

The first group consists chiefly of many of the developed or industrialized countries of the world. Their motivation is dual. On the one hand, the governments of the developed countries are acting in a national security sense to assure their economies continued supplies of strategic raw materials. This desire is based upon both the extreme import dependence of many industrialized countries for a number of important minerals, and the OPEC-induced fear of the future cartelization of some of these commodities.*** The other motivation of the

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**While the ocean in general and the seabed in particular contain a number of valuable resources, the focus in this paper is the potato-like concretions of nickel, copper, cobalt, manganese and a number of trace minerals, known as manganese nodules.

***The actual potential for cartels in strategic minerals is apparently small according to the nine volume, Charles River Associates, Policy Implications of Producer Country Supply Restrictions, Washington, D.C.: Experimental Technology Incentives Program, National Bureau of Standards, February 1977. In particular, the study found that price of cobalt was already near its monopoly optimum. Op. cit., Vol. I, p. 188.

industrialized countries lies in acting as agents for the companies who would like to exploit the seabed minerals. These companies (generally large natural resource companies) see the seabed as a potentially cheaper source of minerals in light of the rapidly rising cost of land-based mining, and are large and technically experienced enough to command the large amounts of financial capital required to develop ocean mining and processing facilities.

The basic negotiating position of these countries in general and of the United States in particular is that of as free access as possible by private enterprise to the seabed minerals. For countries which house potential ocean miners, the self-interest basis of this position is obvious. Unimpeded and lightly taxed (by international authorities), ocean mining for the processing country means decreased import dependence, an improved balance of payments, increased government revenues (through customary taxes) and eventual trickle-down benefits to secondary producers and consumers. But to go along with this pure self-interest argument, the developed countries have at their disposal an economic efficiency, world welfare argument: that the world output of all goods and services would be greater with unfettered ocean mining than without.

The second group consists of those countries who perceive themselves as being net losers should ocean mining become important. These include countries such as Gabon and Zambia who employ more than 10 percent of their workforce in landbased mining or Zambia, Chile, and Zaire who derive more than half their export earnings from copper. Actually, the number of countries which would be net losers from free-access, untaxed ocean mining may be quite small, but it is clearly in the short-run self interest of this group to attempt to either delay ocean mining or to demand compensation for damages suffered from ocean mining. However, the world welfare implications of this approach should be clear, since one would be hard put to find a single technological change in the history of mankind which did not do some harm to someone.

The third group of countries includes those who neither intend to mine the seabed nor have domestic mining industries subject to serious

revenue losses when the seabed is mined, but would still like to benefit from the exploitation of what has come to be considered by many to be international property. While international legal scholars still debate the issue, the seabed has become transformed from being no one's property to being everyone's property, at least in the minds of a large portion of the international community.* If the seabed is international property, reasons this third group, then the international community should share directly in the benefits generated by its use, either through taxation and regulation of miners from private industry or through direct exploitation by an agency representing the international community.

This paper takes on three tasks: (1) to define the economic factors responsible for the very recent interest in ocean minerals, despite the fact that their existence had been known for a century; (2) to examine the likely economic consequences should ocean mining commence under a traditional free-access, unregulated institutional framework for the use of ocean resources; and (3) to examine the potential for the construction of a new institutional framework in light of both economic efficiency and the self-interest of the various nations potentially affected by ocean mining. Thus the paper is constructed in terms of explaining a stimulus and a response -- the stimulus to the interest in ocean mining and both the potential response of the world economy (or the relevant subparts thereof) to the advent of ocean mining and the actual response of the world polity to the threat of this potential response of the world economy.

*The first manifestation of this transformation can be seen in the famous 1967 UN speech of the Maltese Ambassador in which seabed resources were declared to be the "common heritage of mankind." In December, 1969, the UN passed Resolution 2574-D, better known as "Moratorium Resolution," which declared that no claims to seabed ore deposits be recognized and no seabed mining take place until an international regime was established. Then a year later, the General Assembly passed the "Declaration of Principles" Resolution in which it was reaffirmed that the seabed was not subject to appropriation and that no party should acquire or exercise rights to the seabed that were incompatible with the yet-to-be decided international regime.

What will be discovered in Section 1 is that ocean mining will become a viable new sector in the early 1980's due to a convergence of three factors: (1) a significant rise in the value of nodules over the past decade, (2) a decline in the potential cost of ocean mining due to a changing technological environment, and (3) a gradual rise in the cost of the existing method of obtaining minerals through traditional land-based mining. In Section 2 it will be shown that even though the benefits of free-access ocean mining are heavily skewed toward the industrialized countries, only a handful of countries stand to lose from free access ocean mining. Section 3 will discuss several basic economic issues involved in the design of the new institutional framework for allocating ocean resources.

1. Why Ocean Mining Now

One of the first questions that arises concerning ocean mining is "why now?" Why the surge of interest in nodule mining during the early 1970's? While one could phrase an answer in political terms -- that is, in terms of the increasing dependence of the U.S., Japan and other industrialized countries upon the import of strategic raw materials, accompanied by an OPEC-induced fear of the rise of new commodity cartels -- this would only explain why the governments of these countries have become interested.¹ While there is keen government interest -- the Japanese, the United States, the French and the German governments have all devoted some effort to both basic and more commercially-oriented research on manganese nodules -- very large sums of private capital have also been expended on the exploration of ocean mining sites and the development of mining and processing techniques. In short, the private sectors of several countries, but especially of the United States, have decided that nodule mining is finally profitable.

This new profitability has resulted from both a rise in the potential revenue from nodule mining due to the rise in the prices of the minerals contained in the nodules, and from a fall in the cost of

producing metals from the sea, especially when compared to the cost of land-based production. Each of these is discussed in turn.

The Value of Nodules

Since there has never been a market for manganese nodules, neither has there been an observed price. However, there have been markets and observed prices for the component metals which will be won from the nodules. Using historic price data for the four metals most likely to be extracted from nodules, along with prospecting data on the average composition of nodules from three oceans and one private claim, a time profile of the implicit gross value of nodules has been constructed. The profile, depicted in Figure 1, denotes the value of a pound of nodules after mining and processing, assuming no ocean-mining effect on metal prices. What one observes in both the nominal and deflated series is that the value of nodules rose during the early and mid-1950's, peaked in about 1957, slid back until the mid-1960's and then began an almost uninterrupted ten-year ascent, reaching record levels in 1975. So during the past ten years the nominal value of nodules has more than doubled and increased about 50 percent more rapidly than either the U.S. Wholesale Price Index or the I.M.F. Index of World Traded Good.²

However, if one goes back another decade it is clear that, relative to other goods, nodules had barely regained their mid-1950's value by 1975. What this says is that it was not the rise in metal prices alone that stimulated the ocean mining rush of the 1970's, since, to the producer, nodules would fetch just as attractive a price relative to other goods back in 1957 as they would today. The full explanation requires a consideration of the cost side of the ocean mining picture.

Before discussing cost, there is one other story implicit in Figure 1. Nodules are almost ubiquitous in the world's oceans and extensive exploration has taken place in the Atlantic, Indian and Pacific Oceans. As can be seen in the chart, the average Pacific nodule is roughly 20 percent more valuable than nodules from the other

\$/lb.

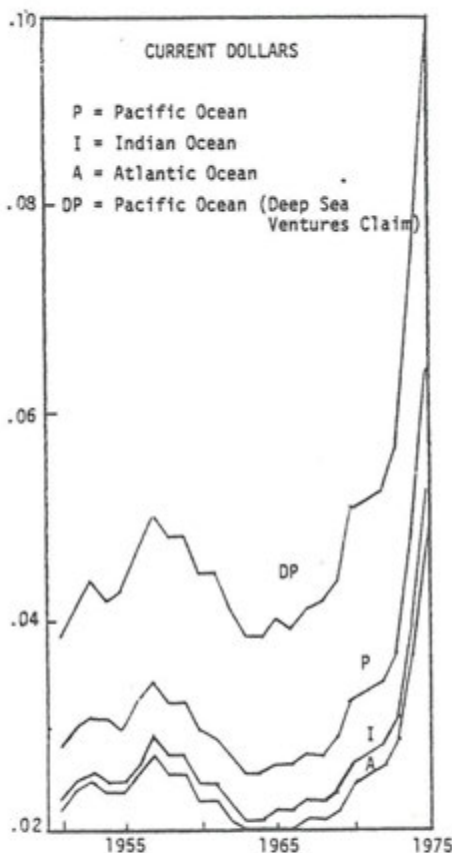
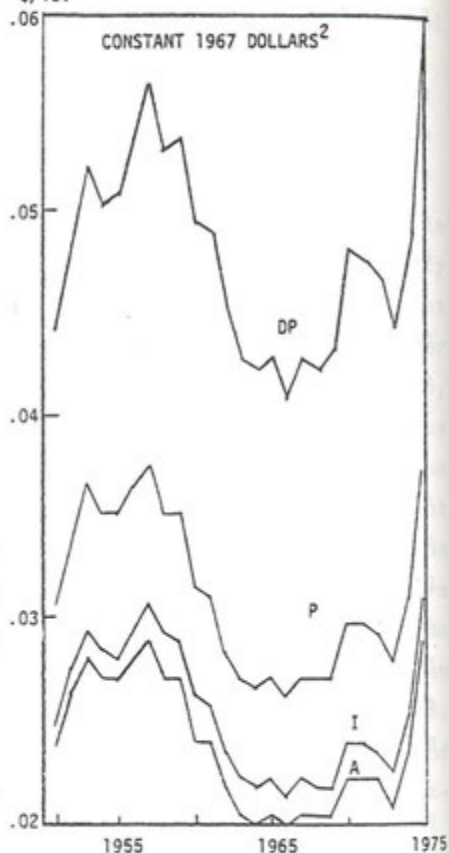


Figure 1
GROSS VALUE OF MANGANESE NODULES
FROM THREE OCEANS, 1951-1975¹

¹This is a weighted sum of the annual average prices of copper, nickel, cobalt and manganese where the weights reflect the mineral content of an average nodule from each ocean.

²Deflated by the Wholesale Price Index.

\$/lb.



Sources: Prices from 1) Commodity Yearbook, New York: Commodity Research Bureau, Inc., various years, and 2) Yearbook of the American Bureau of Metal Statistics, New York: American Bureau of Metal Statistics, various years. Nodule Composition figures from 1) D.S. Crowan, "Regional Geochemistry of Ferromanganese Nodules in the World Ocean" in David R. Horn (ed) Ferromanganese Deposits on the Ocean Floor, Washington, D.C.: National Science Foundation, 1972, p.20; 2) G.P. Glasby, "The Geochemistry of Manganese Nodules from the Northwest Indian Ocean" in David Horn, op.cit., p.99; and 3) Frank T. Manheim, "Composition and Origin of Manganese-Iron Nodules and Pavements on the Blake Plateau," in David Horn, op.cit., p.105.

two oceans. This should explain, at least in part, why all commercial ventures being currently discussed are aimed at Pacific nodules. Deepsea Ventures, the only one of these operations which has publicly "staked a specific claim," is looking to mine an ore which is roughly 50 percent more valuable than the Pacific Ocean average.

Cost of Ocean Mining

It is not really possible to discuss changes in the cost of nodule mining over the past ten or twenty years directly, both because commercial mining has not yet commenced and because cost data are typically one of the most carefully guarded of company secrets, especially in a new industry. Both the mining trade and the academic literature on nodule mining is sprinkled with various cost, revenue and rate-of-return estimates for the 1970's, but even if these were reliable there is virtually nothing before this period with which to compare them and thus establish a trend. However, what is possible is to discuss nodule mining in terms of the technological environment required for its advent. The hypothesis here is that while nodules were just as valuable relative to other goods in the mid-1950's as they are today, the technological environment has changed during those twenty years in such a manner that the cost of discovering nodules, pulling them off the deep seabed and winning metals from them has decreased considerably.

While the technology for simply pulling a few nodules off the ocean floor with a bucket and long cable was available back in 1876 when nodules were first discovered by the HMS Challenger, the discovery only are another matter. Not only are data on ore composition, nodule density, and seabed terrain necessary for calculations of profitability, they are also necessary for the very design of both the mining and processing equipment.

Accurate mapping and assessment of nodule deposits³ has been facilitated by the "dynamic positioning" technology developed in the offshore oil industry -- enabling a ship to be navigated within a few feet of any desired path. Sophisticated sonar depth recorders for

charting seabed topography are another relatively recent offshoot of the offshore oil industry. Widespread deep-sea use of closed-circuit, underwater cameras dates to 1968 when the U.S. Naval Research Laboratory tested a new wide angle camera for surveying seabed nodules.⁴ And a number of smaller developments (such as the tube-type gravity corer to collect undisturbed nodule and sediment samples) have emerged during the past two decades to make the prospecting and exploration phase of ocean mining much more effective than it would have been in the 1950's.

The efficient mining of nodules has also become increasingly possible over the past twenty years. Until only recently, drill vessels and crane barges could lift only about a million pounds of material at a time. Vessels capable of lifting the 2 to 4 million tons required in ocean mining have only been developed during the past decade.⁵ The mining apparatus of the most advanced ocean mining firms resembles a large vacuum cleaner running along the seabed.⁶ This hydraulic lift technology had typically been used to pull coal and ore slurries from depths averaging 750 feet and rarely exceeding 1300 feet, but a quantum extension of the technology was required to reach the 10,000- to 15,000-foot depths which will characterize seabed mining.⁷

Processing technology appropriate to the unique physical and chemical characteristics of nodules has also become more efficient. Prior to 1966, the cost of processing nodules to obtain four minerals was about \$25 per ton of raw nodules. A newly developed leaching technique to extract the basic three minerals has reduced processing costs to about \$8 to \$15 per ton of nodules.⁸

Some of these changes in the technological environment represent new technologies, some represent improvement of old technologies and some simply represent adaptation of old technologies to a new situation. Whatever the nature of the change, these changes in the technological environment have allowed all three components of ocean mining -- exploration, exploitation and processing -- to become relatively cheaper over the past two decades, enough so that the ocean mining which did not take place in the mid-1950's is beginning to do so in the late 1970's and early 1980's.

Ocean Versus Land-Based Mining

But while ocean mining is becoming economically more attractive in its own right, there are several characteristics of land-based mining which are responsible for much of the pressure to develop new mining projects on the seabed rather than on land. For a number of minerals, land-based mining has reached the point where technological change has become unable to offset the movement to increasingly inferior ore bodies. On top of this, the movement to increasingly remote land-based mines involves the construction of an increasingly expensive infrastructure -- an expenditure kept to a bare minimum in ocean mining. And finally, there is some indication that because of the way in which certain mineral prices move against one another, nodule mining may prove more attractive than one- or two-mineral land-based mining with respect to net revenue uncertainty. This section examines each of these three issues.

(a) Ore Quality Decline

The gradual decline in ore quality and accessibility should be no surprise given the rational tendency to exploit the richest deposits first. The quality of nickel ore in New Caledonia (which produced about 18 percent of world nickel output in 1974) has declined from about 9-percent nickel in 1890 to roughly 3-percent nickel in 1950 and 2.3-percent nickel today.⁹ And the sulfide nickel mines in Sudbury (Canada) are some 8,000 feet deep today and are expected to extend to a depth of 12,000 feet within the next two decades.¹⁰ Over the past decade the average copper content of Kennecott's U.S. and Canadian ore has fallen from 0.82 to 0.71 percent -- an ore quality decline of 13 percent.¹¹ While historically technological improvement has tended to offset the effect of declining ore quality and accessibility, mining costs finally appear to be headed upward. One study of cost data for new mineral projects in the U.S. found that capital costs for a given amount of capacity rose 6 percent annually from 1965 to 1970, and 10 percent annually between 1970 and 1975. These cost increases are considerably above the rate of inflation for this period.¹²

This decline in the quality of land-based ore can be contrasted with a very interesting characteristic of deep-sea nodules, specifically that they may be non-exhaustible. There is general consensus that nodules are constantly being formed on the ocean floor, probably from dissolved minerals precipitated out of seawater around some nucleus. While it was once believed that the formation of mineable nodules took centuries, the recent discovery of nodules formed around soft drink caps and the success of forming nodules in the laboratory lead scientists to believe that formation may be relatively rapid.

(b) Relative Infrastructure Costs

A second issue in comparing the attractiveness of nodule and land mining is that of infrastructure development. New land mines, being away from population centers and transport facilities, typically require the development of shelter for workers and transport facilities for the ore. Actual investment costs of 11 major Australian mining projects in the 1960s are broken out into several categories in Table 1. What becomes quickly obvious is that about 65 percent of total investment is for infrastructure development. An advantage of ocean mining is that it minimizes these types of expenditure since (a) no railway or roads need be developed -- the water can take one anywhere, (b) existing port facilities can be used and (c) processing facilities can be constructed near established labor markets, eliminating the need for new worker housing.

(c) Uncertainty

The third phenomenon which might make nodule mining relatively more attractive than land-based mining relates to the relative uncertainty characterizing the methods of obtaining minerals. Producers as producers prefer less uncertainty to more.¹³ Uncertainty raises the unit costs of production via increased information and transaction costs. In order to decide whether an existing mining firm's net revenue uncertainty would be reduced more by adding another land-based mine or a nodule mine to its portfolio, we must examine the two sources of net revenue uncertainty -- cost uncertainty and revenue uncertainty.

Table 1: Investment Costs of 11 Major Mining Projects
Developed in Australia in the 1960s
(in millions)

U.S.\$200	railways and transportation
125	ports
93	townships
73	power and water
24	other
285	mines
<hr/>	
\$800	Total

Source: Conrad G. Welling, Ocean Mining Systems op. cit.,
2nd page_of article.

Cost Uncertainty: In general, investment in a commercially untried enterprise is considered to be riskier than one in a similar, but well-established enterprise. The reason for this is that it is generally easier to forecast future values of variables, given information on their past values. The less past information, ceteris paribus, the more uncertain the forecast. Since commercial nodule mining has yet to commence, it would be considered a riskier investment than a traditional land-based mineral exploitation project. One mineral economist has suggested that before commencement a nodule exploitation project would require a 25 to 30 percent rate of return, in contrast to the usual 15 to 20 percent for land-based mineral projects.¹⁴ Once the technology and other aspects of the nodule mining operation are tried and proven, the risk of such projects should fall, but not necessarily to the level of land-based mining. Once the bugs are out, nodule mining may still be intrinsically riskier than land mining, due to ocean weather uncertainty, for example. On the other hand, nodule mining may prove less risky than land mining, since a nodule deposit may be much easier to evaluate for quantity of contained mineral than a land mine with a lot of overburden, and there would be much less likelihood of labor disruptions in an industry which is likely to use very little labor. Also, once an international Law-of-the-Sea regime is established, there may be less likelihood of changes in the "rules of the game" than would be the case in a single developing country. While it is difficult to say whether eventual cost uncertainty will be greater for sea or land-based mining, it is clear that the cost uncertainty in sea mining should decrease as sea mining becomes an established industry.

Revenue Uncertainty: In theory, product diversification can reduce the risk associated with a firm's earning stream. Whether or not risk is in fact reduced depends both upon the riskiness of the added product (relative to the average riskiness of the existing product line) and the way in which the price of the new product moves with the prices of the established products. Specifically, the

likelihood of diversification reducing risk is greater when the riskiness of the added product is small and when its price moves against the prices of the firms' other products over time.

If one compares the revenue uncertainty (as measured by the coefficient of variation of per pound revenues between 1948 and 1975) of each of the nodule component minerals to the revenue uncertainty of a hypothetically marketed nodule (see Table 2), it turns out that the producers of zinc, copper and nickel would reduce revenue uncertainty by moving into nodule mining, while producers of cobalt, manganese, molybdenum and vanadium would find revenue uncertainty virtually unaffected (assuming that they extracted at least the four basic nodule minerals.)

Table 2: Relative Revenue Uncertainty of Nodule and Component Minerals of Nodules**

.46	nickel
.43	zinc
.38	copper*
.31	nodules (Ni, Cu, Co)
.28	molybdenum vanadium
.27	cobalt manganese nodules (Ni, Cu, Co, Mn)
.26	nodules (Ni, Cu, Co, Mn, Mo, V)

*U.S. Producer price. London Metal Exchange price had a coefficient of variation of .48.

**As measured by the coefficient of variation of per pound revenues of nodules and component metals using monthly data 1951-1975. Coefficient of variation is the standard deviation of a variable divided by its mean to eliminate scale effects.

It should be noted that while the joint product nature of ocean mining could lower the income variability of the ocean miner relative to a single-metal land-based counterpart, a significant amount of ocean mining could even further increase the variance in prices of individual metals, and thus the variance in income of single-metal land-based miners. This is because producers of (fixed proportion) joint products are less free to vary the output level of each of their products in response to price changes, thus weakening the major source of price stability.

But even more important than this might be the desire to hedge one's bets. In some cases, the very prospect of ocean mining changes the outlook for land-based mining. That is to say, if nodule mining promises to be the future source of the bulk of a particular metal, causing a decline in price and the consequent phase-out of a number of land-based mines, then it could be important for land-based mining firms to get in early on this new source of metals. This is really identical to the situation of a new or low-cost technology being introduced into some industry with those who quickly adopt it being more likely to survive and, in fact, even making temporary higher-than-average profit to boot. Thus it should not be surprising that three of the four most serious and advanced ocean mining groups contain three of the world's largest mining companies: Kennecott Copper, International Nickel (INCO), and Union Miniere (of Belgium and Zaire).

Profitability

We have discussed rising metal prices and potential cost reductions in ocean mining via a series of technological breakthroughs as well as the rise in the cost of land-based mining, but this only says that costs and revenues are moving in such a direction as to make ocean mining eventually profitable. Is profitability a decade down the road or is it upon us today? A number of authors have made estimates of the revenues, costs and rates of return to nodule mining. Given that such estimates require long-term forecasts of metal prices, assumptions about how many metals will be extracted from nodules, and an assessment

of the cost of a technology which has yet to be commercially tested, it is not surprising to find pre-tax rate of return estimates ranging from 9 to 112 percent.¹⁵ One survey of these studies found the average pre-tax, rate of return estimate in nodule mining to be roughly twice the average 27-percent rate of return to U.S. mining firms in 1974-1975.¹⁶ The consensus seems to be that nodule mining is potentially very profitable and the R & D investments and lobbying activity of U.S. mining companies tend to support this notion.

Summary

This section has attempted to explain the economic stimulus behind ocean mining. The explanation has noted a decade long rise in the value of nodules (though in constant dollars, 1957 nodules were worth about the same as 1975 nodules), a gradually improving technological environment which has lowered the potential costs of ocean mining, and a rise in the cost of land-based mining because of a decline in ore quality not offset by rapid technological changes in that industry. The relatively large infrastructure costs associated with opening up new land-based mines would be avoided in ocean mining and it is possible that nodule mines, once established, will face less net revenue uncertainty than land-based mines producing one or two minerals. Given that ocean mining has been stimulated, it is now appropriate to turn to its potential economic consequences.

2. The Economic Consequences of Ocean Mining

The question to be addressed in this section is: what would be the economic impact of ocean mining should it take place under the traditional notion of free, unregulated access to all ocean resources lying outside the territorial waters of any country? Ocean mining will most likely not take place within such a framework, since some 140-odd countries have already spent four years attempting to design a new institutional framework to govern both the exploitation of seabed minerals and the use of many other ocean resources. Still, it is

important to address this question for two reasons. First, it was the developing countries' answer to this question which provided an important part of the stimulus to renegotiate rules of ocean usage in the first place. It would be useful to see how the answer reached in this paper compares to the answer reached by the developing countries, since this answer underlies the negotiating position of the Group of 77 in the Law of the Sea Conference.¹⁷ Second, one cannot describe the consequences of ocean mining under the institutional framework which will exist, since the consensus has not yet been reached and a number of frameworks are still possible. Thus a description of the consequences under the old framework could provide a sort of base solution to which consequences under other frameworks could be compared, though such comparisons will not be made in this paper.

The following analysis is crucially dependent upon a number of assumptions and these must be made explicit. There has never before been an international agreement on the proper use of minerals in the deep seabed, but the 1958 High Seas Convention recognized a general free-access-by-all approach to the use of the ocean outside the territorial limits of coastal nations and made specific reference to navigation, fishing, overflight and laying of submarine cables and pipelines. It is here assumed that this free access, unregulated, untaxed approach applies also to the exploitation of deepsea minerals.

The second assumption involves the supply of ocean minerals. With commercial mining not having yet commenced, it is impossible to generate an econometrically estimated supply schedule for ocean minerals. However, there appears to be general industry and government consensus that there are only four groups which will likely become part of the first generation of ocean mining (with production commencing in the early 1980's) and that each of these groups will be producing from one to three million metric tons (dryweight) of nodules per year.¹⁸ It is therefore assumed that the first decade of ocean mining will be characterized by an average annual supply of four to twelve million metric tons of nodules per year. The assumption is somewhat unrealistic since supply will probably not be perfectly price inelastic even in

the short run. However, supply schedules for minerals do tend to exhibit less than unitary price elasticity and the four to twelve million ton production assumption is probably broad enough to include any short-run adjustments in supply.

The third assumption concerns the location of nodule processing. A review of the trade literature and discussions with government and industry representatives reveals that almost all first generation nodules will be processed in the United States and mainly on the West Coast.¹⁹ Considering that the site of first generation seabed mining will be in the North Pacific about halfway between Hawaii and Mexico, that the U.S. probably provides the largest single market for these minerals, that the U.S. (and Canada) are probably perceived to have the most stable investment climates in the immediate area, and that the four ocean mining groups are currently based in the United States, it is probably a fairly safe assumption that the bulk of first generation nodule processing will take place in the U.S.

Given these three assumptions, this section now examines (1) the relative importance of ocean mining in each of the four mineral markets, (2) the nature and likely distribution of the benefits of ocean mining, as well as potential adjustment in: (3) land-based mining, (4) employment, (5) trade and export earnings.

(1) Effect of Ocean Mining on the Four Mineral Markets

It is difficult to discuss the impact of ocean mineral exploitation on employment, trade, and balance of payments without first developing a sense of the relative importance of each ocean mineral in its own market. Though there is some discussion about extracting a number of trace minerals from nodules (such as vanadium, molybdenum and zinc), it is generally believed that nodules will be used to extract nickel, copper, cobalt and perhaps manganese. If 1974 mine production of these four metals were valued at U.S. prices for the refined metal, the total value of all four metals would be roughly \$15 billion, with the value distributed thusly: copper 80.6 percent, nickel 17.3 percent, cobalt 1.5 percent, and manganese 0.6 percent. Even though the

latter two metals are relatively unimportant in terms of volume, they are both important industrial materials -- manganese, for example, is an essential ingredient in steel production, for which there is currently no substitute.

A first-order approximation of the impact of ocean mining on each of these metal markets can be obtained by examining the ratio of the potential seabed production of a mineral to current land-based production of that mineral. Table 3 contains a set of such ratios for each of the four minerals and for five alternative levels of nodule production. What quickly becomes clear from these ratios is that seabed copper will scarcely make a dent in the world copper market, seabed cobalt will surely play a very significant role in the world cobalt market and seabed production of the other two metals will play intermediate roles. Actually, the table overstates the role of seabed manganese for each level of nodule output since only one of the four ocean mining groups currently plans to extract manganese.²⁰ So scaling the manganese column down by a factor of four may provide a better indication of the actual role of seabed manganese in the world manganese market.

Table 3: Seabed Production of Minerals as a Proportion of 1975 Land-Based, World Production^{1/}

<u>Nodule Mining Capacity in millions of metric tons</u>	<u>Manganese</u>	<u>Nickel</u>	<u>Copper</u>	<u>Cobalt</u>
1	3.0	1.8	0.1	8.9
5	14.9	8.6	0.7	44.6
10	29.9	17.2	1.5	89.2
15	44.8	25.8	2.3	133.7
20	59.6	34.4	3.1	178.4

^{1/} Assuming that the average nodule mineral content is the same as that of Deepsea Venture's claim, i.e. 29.00% manganese, 1.28% nickel, 1.07% copper and 0.25% cobalt.

World production figures taken from Commodity Yearbook 1976.

Note also that this table displays the relationship between hypothetical seabed production and actual land-based production in 1975. Since ocean mining is not likely to commence until the early 1980's, the land-based production of these minerals will surely be larger and the ratios of sea to land production correspondingly smaller by that time.

A more refined approach to exploring the impact of ocean mining upon the four metal markets was taken by Adams at Wharton.²¹ On a contract from UNCTAD, Adams built, borrowed, modified and integrated econometric models for the four metal markets, then simulated the production of from one to 20 million tons of nodules, in order to determine new equilibrium levels of prices and quantities. The models generally consisted of demand, supply and price-inventory equations and ranged from the competitive (copper), through the mixed (nickel and manganese) to the monopolistic (cobalt). Adams estimates equilibrium prices, production and consumption for each of the four metals markets, under varying ocean-mining assumptions.

A portion of these estimates (expressed as a percentage difference from the base solution without ocean mining) is presented in Table 4. As might have been expected, the copper market is barely affected by seabed mining. However, all of the other three markets are considerably altered by the seven-ocean-mines scenario. By the seventh year, for example, both Canada and other Western countries would be producing 10 to 11 percent less nickel and nickel prices would be 12 percent lower than they would have been without ocean mining. In the manganese market, significant cutbacks in land-based production keep prices from falling by more than 3 percent. And in the cobalt market, Zaire's willingness to cut back production to a dramatic one-quarter of her base solution level keeps prices from falling by more than 10 percent.

Only two of Adams' results seem counter-intuitive. Because nickel production from tropical laterite ores is considerably more expensive than production from northern hemisphere sulfide ores, one would have expected to see seabed nickel grow at the expense of New

Caledonian, not Canadian nickel, as the study has it. And secondly, it seems highly unrealistic that a monopolist would reduce its output by three-quarters in order to maintain price as the study assumed Zaire would do. Recalling the rule of thumb that a dominant producer stands to increase its revenue only as long as its market share exceeds the price elasticity of demand and noting that the price elasticity of demand for cobalt is on the order of $.34^{22}$, it is not clear that Zaire would reduce its current output (and 60 percent share of the market) by more than about 50 percent.

In summary, the first generation of seabed mining should have a negligible effect upon the copper market and copper producers should thus have little to fear from seabed mining. Nickel producers will find that six years after ocean mining commences, they will be producing about 10 percent less than they would have been and facing a 12 percent lower price than they would have been had ocean mining not taken place. The price of cobalt will be at least 10 percent below where it would have been without ocean mining and land-based output will be down considerably. The price of manganese will be down modestly and land-based output down by almost a fifth. (Note that Adams assumes all producers will extract manganese where, in fact, perhaps only one will do so. Therefore the price and land-based production effects for manganese will not be as large as estimated in Table 4.)

(2) Benefits of Ocean Mining

There is little doubt that the benefits of ocean mining will more than offset the losses. Any time society develops a more efficient method of producing some good, it either has more of that good or more of other goods available since resources now saved in the production of the first good can now be allocated to produce other goods. Most technological changes probably involve a combination of these two effects.

In the case of ocean mining, extensive, lower-cost sources of industrially important minerals should ultimately lower the price to

Table 4

Effects of Sea Bed Production -
Seven Mining Operations
(Percent Difference from Base Solution)

	1974	1975	1976	1977	1978	1979	1980
<u>Copper</u>							
Mining Production							
U.S.	-0.02	-0.1	-0.2	-0.33	-0.44	-0.53	-0.63
Other Western Countries	-0.02	-0.08	-0.15	-0.24	-0.31	-0.39	-0.47
Consumption							
U.S.	0.0	0.01	0.05	0.09	0.13	0.15	0.19
Other Western Countries	0.0	0.04	0.11	0.19	0.25	0.28	0.31
Net Imports of U.S.	0.41	1.29	1.57	1.76	2.09	2.48	2.82
Inventory							
U.S.	0.02	0.05	0.03	-0.14	-0.43	-0.75	-1.08
Other Western Countries	0.28	0.65	1.08	1.54	2.01	2.52	3.1
Price							
Producer Price of U.S.	-0.08	-0.27	-0.54	-0.7	-0.79	-0.89	-0.99
London Metal Exchange Price	-0.23	-0.75	-1.31	-1.25	-1.24	-1.42	-1.55
<u>Nickel</u>							
Mining Production							
Canada	-3.52	-5.63	-7.62	-9.03	-9.94	-11.0	-11.8
New Caledonia	-1.11	-1.74	-2.38	-2.85	-3.22	-3.61	-3.93
Other Western Countries	-2.9	-4.7	-6.36	-7.68	-8.59	-9.65	-10.40
Consumption							
World	0.15	0.54	1.07	1.75	2.57	3.10	4.3
Price	-3.23	-5.26	-7.34	-8.57	-9.56	-10.76	-11.59
<u>Cobalt</u>							
Mining Production							
Congo	-19.81	-30.24	-41.26	-50.94	-60.28	-67.97	-73.56
Outside Congo	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Consumption							
World	0.19	0.48	0.89	-0.14	1.74	2.30	2.79
Price	-2.01	-2.78	-4.04	-5.41	-6.94	-8.35	-9.70
<u>Manganese</u>							
Production from Land Sources	-3.3	-6.1	-8.8	-11.5	-13.9	-15.8	-17.5
Consumption	0	0	0	0	0	0	0
Price	-	-	-0.66	-0.66	-1.14	-2.30	-2.89

Assumptions: Each ocean mining operation produces one million dry metric tons of nodules per year and ocean mining commences in 1974.

Source: Adams, op. cit., p. 148.

consumers of goods containing (or produced with) these minerals. This happens since new mineral technology (which is essentially what ocean mining is) should lower the cost of producing minerals, stimulate a rise in mineral output and a fall in mineral prices. Cheaper minerals stimulate firms who use minerals to produce intermediate and final goods to expand their own output, causing a decline in the price of those goods. If all markets in this linkage are competitive, all cost savings are passed on to consumers in the form of lower prices. Where markets are not competitive, monopolists and oligopolists will tend to transform some of the cost savings into higher profits.

The proper measure of the total benefits of ocean mining would be the increase in consumer surplus plus the increase in factor rents attributable to ocean mining. However, two characteristics stand out concerning the benefits. First, they are spread so thinly as to be unnoticeable by any consumer beneficiary (though not, perhaps by producer beneficiaries) and second, their distribution tends to be highly skewed toward the industrialized countries.

While the aggregate benefits to consumers of ocean mining may be significant, they are likely to be negligible for any given final product or product class. Take the case of manganese. All steel production requires manganese, but this input accounts for no more than about 1.7 percent of the wholesale price of ordinary carbon steel.²³ By the time this steel is combined with labor, capital and other factors of production, the role of manganese in the value of the final consumer good would be measured in terms of tenths or hundredths of a percent. Thus if the price of manganese were even cut in half due to ocean mining (the likely manganese price reduction will be more like 10 percent), no consumer will notice it in the prices of the goods he buys, even though the aggregate consumers' surplus generated may be substantial.

The distribution of benefits from ocean mining will be heavily skewed toward the industrialized countries. Since ocean mining will be undertaken exclusively by firms from industrialized countries, any rents generated will be captured by those firms and their factor

suppliers. Any share in the portion of the benefits by the developing countries will be negligible, since very few factor supplies to or stockholders in these firms will be from developing countries.

To the extent that people in developing countries consume goods containing or produced from the four minerals, they will share in the increased consumer surplus generated by ocean mining. However, since this share is proportional to consumption and since consumption of most goods is positively related to the level of development, the developing countries will likely capture a relatively small share of increased consumer surplus. Table 5 indicates, for example, that per-capita consumption of copper by the United States and the Federal Republic of Germany is more than 100 times per capita consumption in India. While these figures are biased in such a manner that the gap between the industrialized and developing countries is not quite as great as it appears in the table, a correction of the bias, were it possible, would likely only reduce but not erase the gap. (See note in Table 5.)

While the benefits of seabed mining should far exceed the costs, the costs are potentially more concentrated and visible than the benefits. The shut-down of land based mines accompanied by lay-offs of workers and declines in export earnings is an image generated in some discussions of the Law of the Sea. It is the validity of this image that will be examined in the remainder of this section. Potential adjustments in land-based mining, employment, trade and export earnings will be discussed in turn.

(3) Adjustments in Land-Based Mining

Schumpeter referred to technological development under capitalism as the process of creative destruction. When something new and more efficient is created, something old and less efficient is destroyed through the market place. Ocean mining offers just such a potential scenario. Should ocean mining prove to be considerably cheaper than land mining, then a number of land mines face the possibility of being rendered obsolete. Specifically, for this to happen, the production of a particular mineral would have to become so cheap and so much would

Table 5

Per Capita Consumption^{1/} of Refined Copper and Nickel for Selected Countries, 1974

	Per Capita Consumption of copper (lbs)	Per Capita Consumption of nickel (lbs)
Germany, F.R.	25.976	2.175
United States	20.756	2.024
Japan	17.708	2.394
Yugoslavia	11.338	0.146
Brazil	3.435	0.134
Albania	3.377	--
Mexico	2.513	--
India	0.184	--

^{1/} Consumption = production + imports - exports + declines in stocks. Thus consumption refers to use in production regardless of whether the final products are used domestically or exported. To the extent that industrialized countries tend to be net exporters of manufactures their domestic consumption of minerals would be less than the levels shown in the table. And to the extent that developing countries are net importers of manufactures, their domestic consumption of minerals would be greater than the levels shown in the tables. Thus the gap between industrialized and developing countries in terms of domestic consumption of these minerals in final products would not be as great as shown in the table.

Source: Population from World Bank Atlas, World Bank, 1976.
Total Consumption from Metal Statistics 1964-1974, Frankfurt
Am Main, 1975.

have to be produced that price would fall below the land-based cost of production.

There are actually three possible scenarios for each mineral: land mining ceases; land mining continues until existing mines are mined out, with no new land mines being developed; or land mining continues to be a viable industry with both old mining continuing and new mines being developed.²⁴ For the first case to occur, the price of the mineral must fall below the variable costs of the land-based mine, and this would occur only if the total (fixed plus variable) cost of ocean mining falls below the variable cost of land-based mining and sufficient ocean mines enter to actually drive the price down. One

could imagine an ocean mining monopolist who finds his maximum profits in simply collecting a very large rent on a relatively small output, and thus not extending his output to the point where price is significantly affected. But free entry to a new technology (ocean mining) might increase supply sufficiently to lower price below the variable cost of land mines, thus rendering the land mine obsolete.

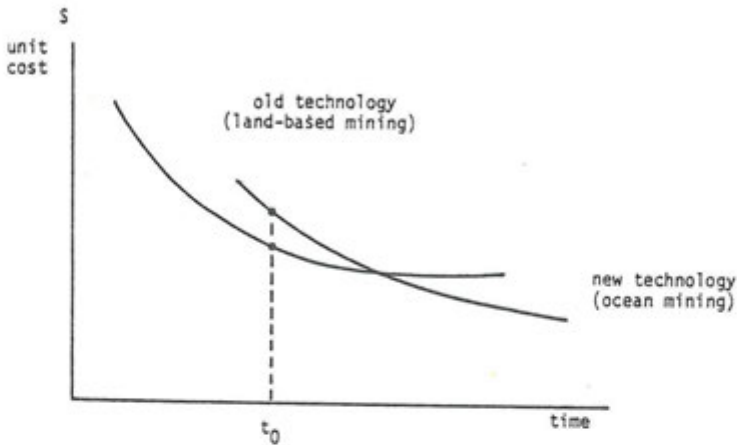
The second scenario would occur where the total cost of ocean mining is above the variable but below the total cost of land mining. In this case, free entry to ocean mining increases supply sufficiently to bring the mineral price down to a level which prohibits new investment in land-based mining but still allows a return that exceeds variable costs in existing land-based mines.

The final scenario is one in which the cost structures of land and ocean mining are actually similar and miners are actually indifferent to expansion into either type. In this case, land and sea mining would continue side by side.

While these categories may be useful, the analysis is simplistically static. Rather than considering only levels of costs, one must also consider time rates of change in cost which probably vary with the age of technology. Thus a given cost relationship between an old and a new technology would not be expected to maintain itself over time and would generally change in such a manner as to make the newer technology increasingly more attractive. A relationship between old and new technologies, and between land-based and ocean mining specifically, might be represented by the curves in Figure 2. The figure has two related characteristics. First, reductions in unit costs are most rapid in the early years of a new technology, and second, a new technology becomes increasingly more attractive than an old technology over time.

Three phenomena lie behind these curves. First is the traditional learning curve²⁵ which demonstrates a positive relationship between productivity and the cumulative level of output. With continued output, this relationship translates into a negative relationship between unit costs and time. Intuitively, this can be viewed as

Figure 2: Time Profile of Unit Costs for Two Technologies of Different Ages



working the bugs out of a new process and generally reducing unnecessary costs as workers and managers become increasingly familiar with the new system. One would expect the returns to these cost-reducing efforts to diminish over time -- thus the curves are convex to the origin. The second element underlying the curves is the economies-of-scale effect. Since new technologies are first adopted on a small scale, it is only over time that they are designed and implemented to bring a firm close to its minimum, long-run average cost. The third element involves changing factor prices. New technologies are typically more capital intensive than the technologies they replace, because of a secular rise in the price of labor relative to the price of capital.²⁶ But given that this rise continues, any given more-capital-intensive technology must become increasingly attractive relative to a less-capital-intensive technology. And since ocean mining will likely be considerably more capital intensive than land-based mining, the curves in Figure 2 show it becoming increasingly cheaper relative to land-based mining as the wage/price-of-capital

ratio marches upward over time.

The most recent land-mining technology is a number of years old (though small innovations do continue in both surface and deep mines) and thus is some distance down on the time-cost profile. Ocean mining, on the other hand, is still in its technological infancy and being at the top of its cost-time profile, is likely to face a much more rapid decline in production costs than will land mining.²⁷ Thus, even though a particular relationship exists between the production costs under the two technologies, this relationship is not likely to maintain itself. So, none of the above-mentioned static scenarios is likely to be an adequate description of reality for very long, and the most probable situation may be one in which the relationship between the two technologies moves very gradually and perhaps discontinuously through all three scenarios (i.e., initial coexistence and eventual obsolescence of the older technology). All of this has been a rather tedious way of saying that creative destruction sometimes takes a little time.

It would be useful at this point to be able to plot the relevant time-cost profiles for ocean and land-based mining for each of the four minerals. Good cost-of-production data are extremely hard to obtain in mining, and we have to confine ourselves to a few more qualitative observations in this matter. All land-based mining operations are clearly not the same and because of lower labor costs and higher ore quality, third-world countries are generally considered to possess lower cost mining operations than the industrialized countries. For example, Chile, Peru, Zambia and Zaire can generally produce copper more cheaply than can the United States and Zaire can produce cobalt more cheaply than can Canada. So, in this sense mines in the industrialized countries are prone to more rapid obsolescence than many third-world mines. An exception to this general trend is nickel, since the best ores (sulfides) are found in the North, especially Canada, while the lower grade and more expensive-to-process ones (laterites) are found in the tropics.

One 1976 study (see Table 6) suggests that nodule mining is likely to be an intermediate cost method of mining nickel, the metal considered to be the major attraction to nodule miners. Land-based nickel mining is concentrated mainly on the higher-grade sulfide ores of Canada, Australia, South Africa and the Soviet Union, though these mines have not been able to keep pace with the growth of nickel demand and the gap has been filled with the more energy-intensive mining of lower grade laterite ores of various tropical areas. While nickel from nodules is likely to cost more than nickel from sulfide ores, it does appear that nodule nickel will be about 30 percent cheaper than laterite nickel in terms of both capital and operating expenses. Thus, in early years, nodules may substitute for laterite ores in filling the growth in the world demand for nickel. What this would mean is that new laterite nickel projects might not be developed, and if energy costs continue to increase more rapidly than the general price level, some of the more marginal laterite mines might actually shut down.

In summary, if land-based mining declines as a result of competition from ocean mining, the transition will likely be rather gradual as we move through the three scenarios and down the two curves discussed above. With the exception of nickel, the marginal land-based mines for nodule minerals probably lie in the developed countries, so it could be there that the first production cutbacks would be faced. This does not mean that the developing countries will not face potential losses, since ocean mining may prevent the development of a number of new third world mines which would have come on line in the absence of ocean mining.

Given that some land-based mining will be phased out and new mining not developed, how serious might the implications of this be for the economies of the countries engaged in land-based mining? This question is now examined with respect to employment, export earnings and trade.

Table 6: Nickel Mining Cost Comparison -- Ocean vs. Land^{1/}

<u>Source of Mineral</u>	<u>capital costs in \$/lb</u>	<u>operating costs in \$/lb</u>
ocean mining (nodules)	3.89 - 5.92	1.01 - 1.39
land-based mining (laterites)		
Indonesia	6.07 - 7.66	--
Guatemala	7.67 - 8.00	--
Dominican Republic	--	1.39
New Caledonia	--	1.67
Japanese producer ²	--	2.87
Philippines	--	0.96

^{1/}Note, the nodule by-products, copper and cobalt, are converted via prices into nickel equivalent, so that costs for nodule mining are actually expressed per lb. of nickel equivalent.

^{2/}Location not given.

Source: Rebecca Wright, "Ocean Mining: An Economic Evaluation," Professional Staff Study, Ocean Mining Administration, U.S. Bureau of Mines, p. 17-18.

(4) Potential Employment Adjustments

One can view the effects of ocean mining upon employment in two ways. Any person released from land-based mining because of competition from ocean mining is both an unemployed person and a person available to engage in other productive activity. Whether one emphasizes the status of unemployment or the status of new employment probably depends upon the state of the particular economy and how rapidly it can transform the individual from a laid-off miner to another type of worker. The cost to a country of having a part of its labor force displaced by ocean mining is inversely related to the tightness of its labor markets. Even with an instantaneous re-employment of displaced labor, some countries could face a net loss of output, since workers will generally be re-employed in an activity where the value they create is somewhat less than they created in

mining (since they would have been initially employed in their highest valued activity). However, this loss could be more than offset if the country is a large net importer of the minerals which will be ocean mined, since cheaper, more abundant minerals could stimulate employment in the manufacturing sector.

One method of assessing the potential employment disruptions that could occur should a country's land-based mines become subject to output curtailments is to examine the portion of each country's work force engaged in the mining of the four minerals to be extracted from nodules. Since data are not generally available for mining employment by type of mineral, employment data for all mining will at least serve as an upper-bound figure. The proposition here is that the degree of economic dislocation is related to the percentage (not the absolute number) of workers employed in the potentially affected sector. Thus, even though Canada employs twice as many miners as Zambia, were all miners in each country to become unemployed, Canada would find it easier to absorb the displaced workers into other sectors than would Zambia, because of the relative size of the two labor forces.

Mining, like agriculture, is an essential sector but one whose relative size shrinks with economic development. Thus, among the industrialized countries listed in Table 7, not a single one has a mining sector which employs more than four percent of its labor force and most have mining sectors employing less than one percent of their labor force. And since only a fraction of those employed in mining are copper, nickel, cobalt or manganese miners, none of the industrialized countries should have a serious problem absorbing into other sectors of their economies any workers laid off from nodule-induced mine closures.

And while most developing countries have a relatively large portion of their populations engaged in agriculture, mining is important only if the country happens to possess the minerals to be mined. Thus, of the 20 developing countries for which mining employment data are available (Table 7), only 4 employ more than 5 percent of their labor force in mineral extraction, and of these, only two are important producers of minerals contained in nodules -- Gabon for manganese and

Table 7: Mining Employment in Selected Industrialized Countries, 1973

<u>Countries</u>	<u>employment in mining (1000)</u>	<u>total employment (1000)</u>	<u>employment in mining as % of total</u>
<u>Industrialized countries</u>			
Canada	123	8,759	1.4
U.S.	638	84,409	0.8
Japan	130	52,330	0.2
Austria	28	3,042	2.5
Belgium	144.2	3,744.5	3.9
Denmark	2.4	2,385.2	0.1
Spain	108.1	12,986.2	0.8
France	197	20,939	0.9
Fed. Rep. of Germany	320	26,202	1.2
Ireland	10	1,041	1.0
Italy	318	18,500	0.2
Norway	12	1,654	0.7
Netherlands	13	4,553	0.3
Sweden	18	3,879	0.5
U.K.	363	24,641	1.5
Australia	69	5,640	1.2
New Zealand	4	1,141	0.4
USSR	2,051	113,152	1.8
<u>Group of 77 (developing countries)</u>			
Egypt	15.4	8,712.4	0.2
Gabon (1972)	7.0	68.5	10.2
Kenya	3.1	761.7	0.4
Malawi	0.8	215.7	0.4
Mauritius	0.1	136.8	0.1
Swaziland	2.9	57.0	5.1
Tunisie	25.0	1,417.0	1.8
Uganda	5.3	347.6	1.5
Zambia	62.0	380.7	16.3
Jamaica	79.6	629.6	12.6
Panama (1972)	0.5	449.4	0
Cyprus	3.8	258.9	1.5
Rep. of Korea	47.0	11,139.0	0.4
Pakistan (1972)	79.4	18,107.5	0.4
Philippines	62.0	13,262.0	0.5
Singapore	1.9	595.5	0.3
Syria	14.4	1,612.1	0.9
Thailand	110.9	17,042.7	0.7
Malta	0.5	101.6	0.5
Yugoslavia	166.0	4,213.0	0.4

Source: International Labour Office, Yearbook of International Labour Statistics, 1975.

Zambia for copper. Gabon's development of new oil fields²⁸ should ease any adjustment to a fall in the world price of manganese, but as oil production is considerably less labor-intensive than manganese mining, the value of new oil must be several times the value of lost manganese to avoid the short-term rise in the unemployment rate that might otherwise occur. And aside from Zambia, there are several countries, such as Zaire, Chile and Peru, which likely have considerable segments of their labor force employed in mining generally and copper mining in particular, though the U.N. did not report mining data for those countries. But again, copper miners have the advantage that it should be a full decade, at least, before ocean mining begins to have any noticeable effect on copper prices, so there is plenty of time for anticipatory government policy.

So it is unlikely that ocean mining will considerably raise unemployment rates in any country. The countries with the largest percentage of their labor forces in mining tend to have them employed in non-nodule minerals (e.g., bauxite in Jamaica) or in copper, which is fairly well insulated from ocean mining competition over the next decade. The exception is Gabon which employs 10 percent of its work force in mining, much of that being manganese mining, but employment problems will be at least partially offset by the rapid growth of the petroleum industry in that country.

(5) Adjustments in Trade Patterns and Export Earnings

In theory, ocean mining could affect international trade in three categories of goods: (1) the minerals to be mined, (2) the inputs to the mining industry and (3) the various intermediate and final products produced with the minerals. However, because ocean mining demand for various categories of inputs is likely to be such a small portion of total demand for those inputs and because the value of metals is generally such a small portion of the total value of the final, or even intermediate, goods produced with them, trade in those two categories of goods is likely to be imperceptibly affected. Measurable effects will probably occur only in trade in the four basic nodule minerals.

The first-round shifts in trade patterns should essentially involve reductions in U.S. imports of the four minerals, since practically all nodule processing will take place in the United States.²⁹ Given the fact that mineral prices will fall, however, increased U.S. demand should keep imports from declining by the full amount of the seabed output. Also, first-round shifts may be very temporary and the post-ocean-mining equilibrium structure of trade may be to the detriment of countries that are not major sources of U.S. imports. That is to say that some producers now shipping to the U.S. may have relatively low production costs and thus be able to penetrate other markets at the expense of more marginal producers. Without production cost data, it is difficult to suggest what the post-ocean-mining equilibrium structure of trade will look like. It is possible, however, to say something about first-round shifts and the vulnerability of various economies to these shifts.

In order to determine which countries' exports may be immediately displaced by the advent of ocean mining, it is necessary to note which countries are important U.S. suppliers of these minerals. Table 8 allows one to determine roughly the extent to which total U.S. imports will be displaced (by comparing total imports to potential seabed production), whose imports will be displaced (by examining the list of importers), and how serious the impact of such displacement might be (by noting the share of each country's mineral production being exported to the United States). Each mineral is discussed in turn.

Manganese

Because most manganese is used in steel production and because it accounts for such a small amount of the final value of steel, the demand for manganese is almost completely price inelastic.³⁰ Thus, unless other currently minor uses of manganese were expanded dramatically or new uses developed, there would likely be little short-run increase in demand. So if all seabed miners extracted manganese from their nodules, ocean production of manganese might easily fill U.S. import needs in the early 1980's (Table 8). If, on the other hand, only one of the four mining groups (Deepsea Ventures) extracts manganese, as is currently anticipated, and if this group sends up to half

Table 8
U.S. Imports of the Four Metals to be Extracted from Seabed Modules, 1973
(1000 short tons)

Country	U.S. Manganese Imports		U.S. Cobalt Imports	
	1000 short tons	% of country's production exported to U.S.	Country	1000 lbs.
Brazil	303	27%	Zaire	11,196
Gabon	196	19	Belgium	4,819
South Africa	167	9	Norway	972
France	107	a	Finland	909
Australia	61	8	Canada	666
Mexico	44	31	France	204
Norway	39	a	U.K.	192
Zaire	36	20	Taiwan	109
India	35	6	West Germany	40
Japan	21	36	Australia	5
Ghana	19	14	Other	89
Morocco	14	17	Total Imports	19,201 (25,601) ^e
Other	16	17	seabed output, low ^d	22,000
Total Imports	1,058 (1,411) ^e		seabed output, high ^d	66,000
seabed output, low ^d	1,279			
seabed output, high ^d	3,837			

^a France obtains all its manganese from Gabon, Morocco and Brazil. Norway obtains its manganese from Brazil.

^b Belgium obtains its cobalt from Zaire, Norway from Canada, U.K. from Zambia, West Germany from Finland. It could not be determined from the data where Taiwan obtains her cobalt. Other obtains cobalt from Zambia and Australia.

^c Norway obtains its nickel from Canada, U.K. from Canada and South Africa, and France from its possession, New Caledonia.

Table 8 (continued)

U.S. Copper Imports			U.S. Nickel Imports		
Country	1000 short tons	% of country's production exported to U.S.	Country	1000 short tons	% of country's production exported to U.S.
Canada	142	16%	Canada	121	45%
Peru	86	36	Norway	15	c
Chile	54	7	Dominican Republic	14	53
South Africa	23	12	U.K.	11	c
Philippines	15	6	New Caledonia	10	9
Mexico	11	12	Australia	5	10
Zambia	5	1	Rhodesia	4	30
Other	36	5	USSR	4	2
Total Imports	372 (496) ^e		South Africa	3	30
seabed output, low ^d	47		France	2	c
seabed output, high ^d	142		Greece	2	12
			Other	1	12
			Total imports	192 (256) ^e	
			seabed output, low ^d	56	
			seabed output, high ^d	169	

^dLow seabed output assumes four firms produce one million metric tons of nodules each and high seabed output assumes four firms produce 3 million metric tons of nodules each.

^eEstimated 1991 imports, assuming imports grew at 3.5 percent annually -- the long term real rate of growth of the U.S. economy. Ocean mining is expected to commence around 1981 or perhaps a bit later.

Source: Mineral Facts and Problems 1975, Washington, D.C.: United States Bureau of Mines, 1976.

its nodules to Belgium for processing, then as little as 12 percent of U.S. requirements might be met from the ocean. Spread evenly over the dozen countries exporting to the U.S., a 12-percent cutback in manganese imports should not cause very serious adjustment problems. However, if cutbacks were not spread evenly, manganese producers in countries such as Japan, Mexico and Brazil, where a quarter to a third of total manganese output is exported to the U.S., could face difficulties in quickly finding other markets to which to shift their exports.

Note, however, that for most of the manganese exporters to the U.S., this mineral accounts for but a tiny share of total export earnings (Table 9). The exception is Gabon which derived almost a fifth of its export earnings from manganese in 1971. However, even Gabon is not in as precarious a position as might first appear. Since manganese accounted for a fifth of its export earnings and since only a fifth of these manganese exports found their way to the U.S. in 1973, only 4 percent of Gabon's export earnings was derived from U.S. imports of Gabonese manganese. So even with a total withdrawal from the U.S. market, accompanied by, say, a 10-percent fall in the price of manganese (recall that Adams predicted a 3-percent fall), Gabon's export earnings would decline by less than 6 percent. Furthermore, as mentioned earlier, petroleum is becoming an increasingly important export of Gabon and could well forestall any actual decline in export earnings should Gabon be forced to cut back its production of manganese.

Cobalt

Even the low estimate of seabed cobalt production would have more than fulfilled U.S. cobalt requirements in 1973 and would almost satisfy projected U.S. cobalt requirements in 1981 (Table 8); the U.S. currently obtains no cobalt from its own land mines. Since Zaire is the source of most U.S. cobalt -- more than 80 percent in 1973 (including that shipped through Belgium) -- and since almost half of all Zairean cobalt finds its way to the U.S. (Table 8), that country clearly stands to lose the most, at least temporarily, from the U.S.

Table 9: Export Dependence on Manganese, 1974
(in thousand U.S. \$)

<u>Country</u>	<u>Manganese Exports</u>	<u>Total Exports</u>	<u>Manganese Share of Total Exports</u>
South Africa	84,465	4,906,101	1.7
Gabon (1971)	33,717	177,845	19.0
India	19,643	3,906,068	0.5
Brazil (1973)	18,866	6,199,192	0.3
Australia (1971)	15,964	5,072,647	3.1
Morocco	10,782	1,773,525	0.6
Ghana	9,117	646,611	1.4
Zaire (1970)	2,009	735,366	0.3
New Hebrides (1973)	387	17,602	2.2

Source: United Nations, U.N. Statistical Yearbook, 1975.

United Nations, Yearbook of International Trade Statistics, 1975, Vol. I.

mining of seabed cobalt. However, since only about 6 percent of Zaire's export earnings are derived from cobalt (Table 10), withdrawal from the U.S. market accompanied by a 20-percent reduction in price in other markets (Adams forecast only a 10-percent price reduction) would result in, at most, a 4-percent decline in export earnings from the level which would exist in the absence of ocean mining. Zaire is not so fortunate as Gabon to have discovered relatively large amounts of petroleum to help offset these losses. However, a 4-percent decline is not unmanageably large, especially since the country has a number of years to plan for the event. Even though Finland and Canada also send respectable shares of their cobalt output to the U.S., cobalt does not account for even one percent of export earnings for either country. Thus, even though all cobalt producers face price and thus revenue declines (demand for cobalt is price inelastic), only Zaire should suffer a noticeable decline in export earnings.

Table 10: Export Dependence on Cobalt, 1974^{1/}
(in millions of U.S. \$)

Country	Mine Production of Cobalt	Total Exports	Cobalt Share of Total Exports
Zaire	132,479	1,381,458	9.6
Zambia	19,376	1,136,229	1.7
Canada	14,552	32,783,390	0
Morocco	13,234	1,777,525	0.7
U.S.S.R.	13,015	27,405,003	0
Finland	9,590	5,521,587	0.2
Cuba (1972)	8,330	837,936	0.1
Norway	7,535	6,274,399	0.1
France	6,850	46,139,346	0
Australia	5,823	10,787,293	0
W. Germany	2,685	89,165,480	0

^{1/} Note that these are production, not export figures (export data on cobalt was not available) so that as indicators of export dependence the ratios are biased upward somewhat.

Source: Commodity Research Bureau, Inc. Commodity Yearbook 1976.

United Nations, Yearbook of International Trade Statistics, 1975, Vol. I.

Copper

The copper market, as explained earlier, is, by its size, the most insulated from any disruption by ocean mining. A full 10 million tons of ocean nodules would not even generate copper equivalent to 2 percent of 1975 world copper production (Table 3). And for Adams' 7 million-tonsof-ocean-nodules scenario, neither price nor land-based production would fall by even one percent (Table 4). Thus, even though a number of countries derive very large shares of their export earnings from copper (especially Zambia, Chile and Peru; see Table 11), ocean mining is likely to have a negligible effect on these export earnings.

Table 11: Export Dependence on Copper^{1/} (1974)
(in thousand U.S. \$)

Country	Copper Exports	Total Exports	Copper share of Total Exports
Chile	1,897,959	2,480,567	76.5
Zambia (1973)	1,072,418	1,136,229	94.4
Belgium-Lux.	1,042,632	28,125,619	3.7
Zaire	953,826	1,381,458	69.0
Germany, Fed.	974,915	90,021,382	1.1
Canada	661,628	32,783,390	2.0
Japan	715,553	55,537,758	1.3
U.S. incl. Puerto Rico	433,402	98,506,890	0.4
United Kingdom	427,856	8,661,515	1.1
Philippines	396,725	2,701,161	14.7
Peru	347,910	1,499,300	23.2
Australia	303,796	10,787,293	2.8
South Africa	283,583	4,906,101	5.8
France	249,035	45,139,46	0.6
Yugoslavia	216,288	3,804,590	5.7
Sweden	188,744	15,909,463	1.2
Italy	146,998	30,251,786	0.5
Netherlands	129,969	32,734,235	0.4
Indonesia	117,276	7,426,338	1.6
Norway	90,954	6,274,399	1.4
Finland	64,713	5,521,587	1.2
Austria	59,612	7,161,482	0.8
Switzerland	48,781	11,838,027	0.4
Mexico (1973)	41,662	2,631,496	1.6
Spain	27,205	7,058,608	0.3
Ireland	26,469	2,629,497	1.0
Israel	24,550	1,824,859	1.3
Turkey	21,561	1,537,822	1.4
Uganda	16,891	315,361	5.4
Denmark	14,951	7,683,430	0.2
Morocco	8,732	1,773,525	0.5
India	5,908	3,906,068	0.1
Nicaragua (1973)	1,009	274,652	0.4

^{1/} Includes both unrefined and refined copper (SIC Codes 682 and 283.11)

Source: United Nations Yearbook of International Trade Statistics, 1975,
Vol. I and Vol. II p. 145,238.

Ocean mining will, however, stimulate some minor restructuring of world copper trade. The United States imports a relatively small portion of its primary copper -- about 15 percent over the 3 years 1972 to 1974³¹ -- and obtains three-quarters of this imported copper from Canada, Peru and Chile (Table 8). Seabed copper output is estimated to substitute for about 10 to 30 percent of these copper imports by 1981. If these curtailments of copper imports are spread rather evenly over the seven major exporters listed in Table 8, no one country will have to redirect more than 10 percent of their copper exports and most will have to redirect less than 3 percent. The worst that could happen in terms of trade adjustments would be for Peru to be cut off from the U.S. market completely. Peru would then have to find new markets for over a third of its copper and face a temporary loss of about 8 percent of its export earnings while it did so. However, given the fact that Peru's total copper exports account for less than 3 percent of the world copper trade, finding new outlets, even under this worst-case scenario, should not prove overly difficult -- especially given the lead time available for developing new markets.

Nickel

Of the nickel exporters listed in Table 12, most derive less than one percent and all but one derive less than three percent of their export earnings from this metal.³² By the early 1980's, from 22 to 66 percent of U.S. nickel imports could be eliminated by seabed mining (Table 8). Depending upon how these cutbacks are distributed, nickel producers in some countries could find themselves having to locate new outlets for as much as a third (e.g., Rhodesia and South Africa) to roughly a half (e.g., Dominican Republic and Canada) of their nickel output. The maximum impact that seabed mining could have in the first round of trade restructuring would be for the Dominican Republic and New Caledonia to each face up to an 8-percent temporary decline in export earnings. In the longer run, however, it should be the nickel producers of the tropics and subtropics (such as the Dominican Republic, New Caledonia, Cuba and a few others) whose expensive-to-process laterite ores will not be able to compete if faced

Table 12: Export Dependence on Nickel^{1/} (1974)
(in thousand U.S. \$)

Country	Nickel Exports	Total Exports	Nickel share of Total Exports
Canada	498,385	32,783,390	1.5%
United Kingdom	218,966	38,661,515	0.6
Norway	167,174	6,274,399	2.7
New Caledonia (1973)	121,366	N.A.	N.A.
Australia	115,826	10,787,293	1.1
U.S. incl. Puerto Rico	114,668	98,506,890	0.1
Germany Fed.	98,821	89,165,480	0.1
Dominican Rep.	93,097	636,826	14.6
France	53,484	45,139,346	0.1
South Africa	40,656	4,906,101	0.8
Netherlands	32,607	32,734,235	0
Finland	19,973	5,521,587	0.4
Sweden	17,625	15,909,463	0.1
Switzerland	11,862	11,838,027	0.1
Japan	10,594	55,537,758	0
Belgium-Lux.	9,583	28,125,619	0
Italy	7,477	30,251,786	0
Austria	3,301	7,161,482	0
Ireland	2,533	2,629,497	0.1
Spain	1,028	7,058,608	0
Hong Kong	946	5,906,788	0
Malaysia	746	4,234,244	0
Chile	558	2,480,567	0
Singapore	179	5,785,144	0
Denmark	106	7,683,430	0
Burma	100	195,390	0
Portugal	13	2,302,044	0

^{1/} Includes both unrefined and refined nickel (SIC codes 683 and 283.2)

Source: United Nations Yearbook of International Trade Statistics, 1975,
Vol. II, p. 146, 239 and Vol. I.

with a declining price of metal.

In summary, ocean mining will cause some restructuring of mineral trade patterns as well as some decline in export earnings. Zaire, for example, could face a 4-percent decline in export earnings due to a fall in its cobalt exports and a fall in market price. Gabon could face a 6-percent decline in export earnings from displacement in the U.S. market by seabed manganese, though this decline would probably be more than offset by a rise in oil production and prices. The copper market should be the least affected, though one worst-case scenario has Peru facing a temporary 8-percent decline in export earning as it searches for new outlets for its copper. Finally, seabed nickel could cause serious adjustments for a number of nickel producers, but no country, save New Caledonia and the Dominican Republic, faces potentially serious declines in export earnings.

Summary

Part II of this paper has attempted to outline the economic consequences of ocean mining should it proceed under a free-access, non-taxed and unregulated institutional framework. From the discussion of ocean mining's potential effect upon prices and quantities of the four minerals, and the employment level and export earnings of countries currently producing the mineral from land-based mines, a picture of a rather modest impact of ocean mining emerges. The most likely situation is one in which few countries will face serious economic adjustments after the advent of seabed mining. The only countries likely to be noticeably affected include Gabon, Zaire, the Dominican Republic and New Caledonia, since they could face temporary declines in export earnings of up to 6 percent, 4 percent, 8 percent and 8 percent respectively in the worst-case situations.

3. Political Response: Redesigning the Institutional Framework

The previous sections have examined the stimulus to ocean mining and discussed the likely market response to the first generation of the seabed production of minerals should it occur under a traditional free-

access approach to ocean resources. In reality, economic and political systems are inextricably mixed and individuals and groups pursue their objectives through both. Thus, the perceived economic effects of ocean mining have stimulated a political response and this political response, in turn, is transforming the institutional framework within which the seabed will be mined, thus resulting in a different set of economic effects than those originally perceived. What is intended in this final section is to delineate the basic three interest groups in the ocean-mining debate, suggest forms of compromise, and discuss economic efficiency considerations for implementing these compromises.

(1) Political Trade-offs

From the discussion in the previous section there emerge three categories of countries with respect to seabed mining: (1) the industrialized countries in general and the (potential) ocean-mining, industrialized countries in particular which would receive the lion's share of the benefits; (2) a small number of developing countries which stand to suffer temporary losses in export revenues of up to 8 percent; and (3) a very large number of countries which will be essentially unaffected by ocean mining in any measurable sense. It is not difficult to see that the interests of these groups are not in harmony. The first group stands to gain the most from a free-access, unregulated, first-come first-served framework. The second group would gain most from a total prohibition on ocean mining. The third group would gain most from a situation in which full seabed production was assured but all economic rent was taxed away to be redistributed according to some agree-upon criterion.

If the first group would satisfy itself with only the increased consumer surplus generated by this new source of minerals, and give up any economic rent captured by its ocean mining firms, then the first and third groups would be no longer in conflict. This assumes that taxing away the rent is both administratively feasible and would not reduce the level of ocean-mining activity from its free-access optimum, about which more will be said in a moment.

The conflict between both of these groups and the middle group

would not be reduced by this compromise, unless the appropriated rents could be used to compensate, in some way, the middle group for the losses to its land-based mining sector. Whether the advent of ocean mining could be made truly Pareto-superior through such a move depends upon two factors. First, the third group of countries must be willing to allow the general fund of appropriated rents to be reduced by the amount sufficient to compensate the middle group, thus having less for themselves. Second, the fund of appropriated rents must be large enough to actually allow compensation for losses to the middle group. While the benefits (increased rents plus increased consumer surplus) will surely exceed the losses (the reduction in factor incomes in land-based mining) when ocean mining occurs, there is no assurance that the increase in rent alone will exceed the losses. Thus, even if the third group is willing it may not be able to compensate the second group out of the appropriated rent fund.

But whether or not full compensation is possible, the total benefits do outweigh the total costs since new, more efficient technologies allow greater production with the same use of resources, and it is not at all clear that it would be either a socially or economically progressive precedent to prevent the introduction of a new technology, because compensation of the losers was not administratively possible. If one were willing to look far enough back in history, an application of such a principle could have prevented the transition from the stone age to the age of metals and thus destroyed the basis for the business of these very land-based producers who are attempting to impede the progress of the new transition. In other words, accepting the principle that prohibited any technological innovation which did not allow full compensation of the losers would be putting a strong fetter on material progress. So while it may be best to have compensation for the losers accompany a new technological development, when such compensation is impossible, it is better to have technological change without compensation than to have no technological change at all.

(2) Considerations for Economic Efficiency

There are two criteria or sets of criteria to guide the architects of the new institutional framework -- an equity criterion and an economic-efficiency criterion. Neither is unambiguous. The equity criterion involves some acceptable interpretation of the notion that the resources of the seabed are the common heritage of mankind -- a principle that has been accepted, in one form or another, by practically all countries. While the equity criterion will not be discussed here, it is assumed that an internationally acceptable interpretation will involve either some type of system of taxation or some type of direct participation which will allow the developing countries a more proportionate share of the benefits than they would have received under a free-access, untaxed system. The Single Revised Negotiating Text which was serving as a basis for negotiation in the Law of the Sea Conference during early 1977 supports this assumption, since it contains provision for both taxation of private mining firms as well as direct seabed exploitation by an international agency. The efficiency implications of both taxation and direct exploitation by an international agency will be discussed.

Rent Tax Does Change Output Decisions

Even the economic efficiency criterion is not unambiguous. For example, could the rent accruing to ocean mining be taxed away with no effect on the level of ocean mineral production? There are two important questions in the general issue of taxing economic rent, one theoretical, the other administrative. First, is it correct to maintain that economic rent can be taxed away (either all or in part) without causing any distortion in the allocation of scarce resources? Second, can economic rent actually be identified in the real world and can a tax be designed which can capture economic rent and only economic rent? We concern ourselves here with only the first question, for if the first is answered in the negative, then the second becomes largely irrelevant.³³

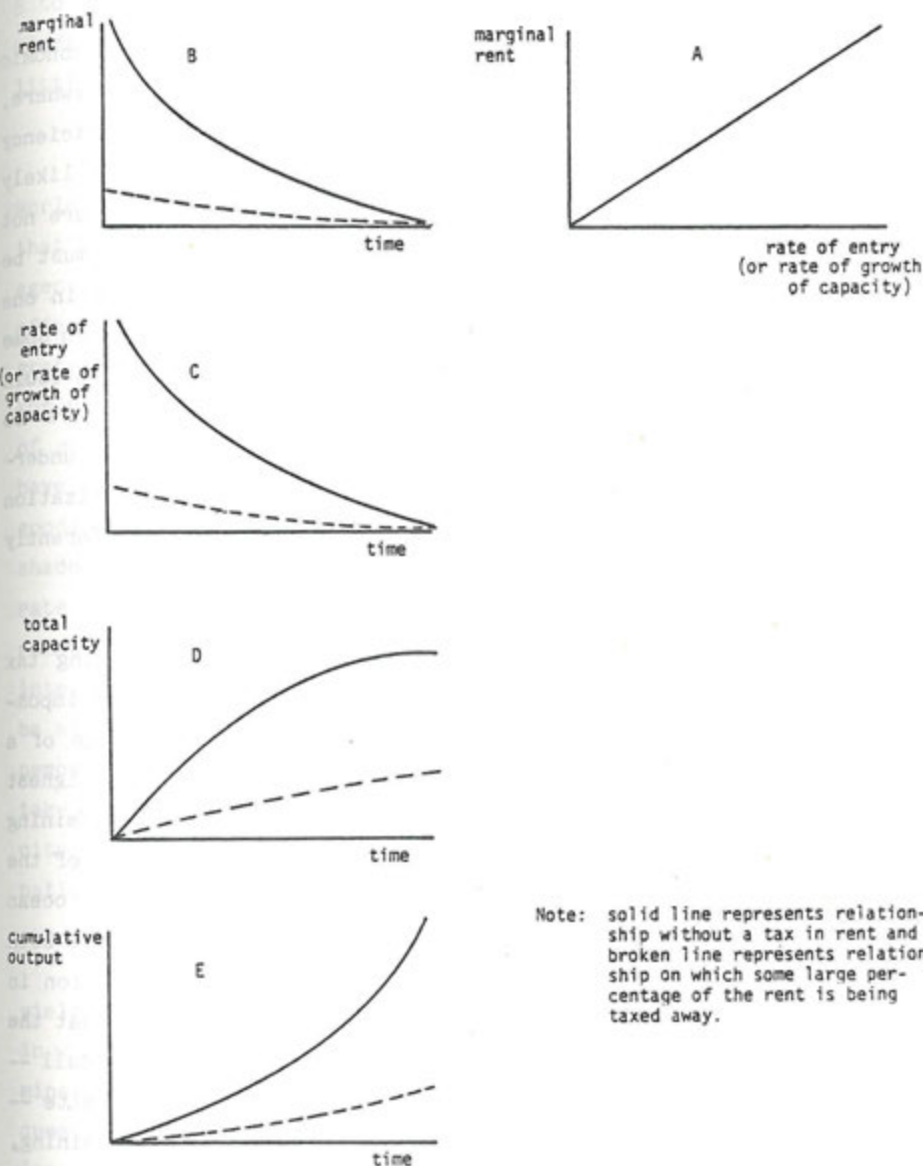
Given the very definition of rent (i.e., as the return above the minimum return necessary to induce all factors, to assemble themselves

to perform the activity in question) and given a fully competitive, instantaneously-adjusting world, a tax which only captures some portion of rent and no portion of any factor return will create no distortions in the allocation of resources.

What characteristics of the real world would allow a pure rent tax to create distortions in the allocation of resources? One of these is the time dimension to decision making. In the real world, it takes time to acquire and process information. Investment funds thus do not flow instantaneously into all projects for which the rate of return exceeds the cost of capital. In fact, the higher the expected rate of return for projects in a given sector, ceteris paribus, the more rapidly funds should be expected to flow into that sector, the more rapidly that sector will become developed, and the greater the level of output from that sector at any point in time.

The effect of a rent tax on output, given the non-instantaneously adjusting nature of the real world, is traced out in Figure 3. Graph A denotes the positive relationship between the marginal rent (i.e., the rent captured by the last project) to be obtained in a sector and the rate of entry (or growth in investment) in that sector. Given that the entrance of new firms decreases the marginal rent, Graph B shows the decline of the marginal rent over time, and Graph C the associated decline in the rate of entry over time. With a declining rate of new entry, total capacity in the sector increases at a decreasing rate as depicted in Graph D and as long as capacity is increasing (and utilized), the cumulative level of output is increasing at an increasing rate. The solid curves represent a no-taxed sector and the dotted lines that same sector with a portion of the rent taxed away. Note that marginal rent and rate-of-entry curves tend to converge as the marginal rent falls to zero. However, the level of cumulative output does not converge, demonstrating that the cumulative level of production falls as the rent tax rises above zero. Thus while the imposition of a rent tax does not affect the short-term production decision, it does affect the intermediate-term production decision and thus the total amount of the product produced over a given period of time.

Figure 3: The Effect of a Rent Tax on Output



Ocean-Mining Tax Must Be Harmonized with Other Taxes

Note that this argument is based upon the assumption that economic rent is not taxed away in other sectors. If all rents, everywhere, were taxed away there would be no effect upon allocative efficiency among sectors (though the redistribution of the rents would likely involve some change in expenditure patterns). However, rents are not everywhere taxed away and the tax treatment of other sectors must be considered when examining the allocative efficiency of a tax in one particular sector. If, for example, land-based mining is taxed in some particular fashion, then to tax ocean mining in another fashion could cause the relative private rates of return in the two sectors to diverge from the relative social rates of return, resulting in underinvestment in one of the two sectors. The problem of tax harmonization is complicated by the fact that land-based mining is taxed differently in different countries.³⁴

Competitive Bidding Inadequate

However, given that the international collage of existing tax schemes probably makes the conceptual design of an optimal tax impossible, a few general remarks can be made regarding the design of a reasonable tax. One concerns allocating mining sites to the highest bidder and the other the imposition of a profits tax on ocean mining firms. In a world of atomistic competition and full knowledge of the cost and revenue structures associated with each potential ocean mining site, the allocation of sites by competitive bidding would both appropriate the full amount of the rent and avoid any distortion in factor proportions or short-term output levels. To the extent that the number of bidders relative to the number of mine sites is very small -- there could easily be only a single bidder for any given mine site -- and the fact that there is a great deal of uncertainty in ocean mining, at least in its early stages, the portion of the rent appropriated would likely fall considerably below 100 percent. In a study of Alaskan oil, for example, Norgaard found that game-strategic approaches to bidding caused the level of bids to be highly sensitive

to the number of bidders and to allow capture of only about 5 to 20 percent of the rent.³⁵ Thus reliance solely upon competitive bidding for ocean mining sites would probably generate relatively little revenue for redistribution.

Profits Tax and Firm Behavior

A second candidate, used by practically every country in the world, is the profits or net income tax.³⁶ This tax has the advantage that it requires no competition for mine sites and it has the taxing agency sharing in the risk faced by the firm. However, in order to be effective, the mining companies (which currently plan vertically integrated operations) would have to establish seabed mining as an entity (or profit center) separate from nodule processing, and create a sort of shadow market in nodules. Since vertically integrated companies have considerable latitude in the way they price internally exchanged goods and services, one should expect to find relatively low nodule shadow prices if the international seabed tax is greater than the tax rate prevailing in the countries in which processing takes place, and relatively high nodule prices if the opposite is true. From the international taxing agency's point of view the optimal tax rate will be at least as high as that prevailing in the processing country (48 percent during the first generation since processing will initially take place in the U.S.) and perhaps higher depending upon the elasticity of shadow nodule prices with respect to the international-national tax rate differential.

Exploitation by an International Agency

Would a free-access, appropriately taxed seabed mining framework yield a higher level of benefits to each country than would a framework in which an international agency became the exclusive producer of ocean minerals? Unfortunately, an unambiguous analytic answer to this question is not possible, though the relevant considerations can at least be pointed out. If the international agency had the technological and financial support to be as efficient as the best potential nodule producer from private industry, and if the agency made the same production decision that would be made by a number of private

producers,³⁷ then the agency would extract both the rent and the normal profit from seabed mining and thus end up with larger revenues than would be the case if it were only taxing away the rent from a number of private operators. Also, since uncertainty over returns to ocean mining and administrative difficulties would probably mean an appropriation of less than the full amount of the rent in the open access case (recall the example of Alaskan oil discussed earlier), the exclusive agency would do better to mine itself since it would be guaranteed the full amount of the rent.

The key assumption in this comparison is that the agency would be as efficient as the best potential nodule producer for the private sector. In the real world this is far from the truth at the present time. If an international mining agency were created tomorrow, it would have access to only a portion of the existing body of knowledge on seabed mining. While most of the basic scientific information on nodule formation, composition and distribution is in the public domain, much of the practical information on mining and processing technology along with detailed mine site survey data is proprietary information, and there is no way that an international agency could acquire this information short of purchasing it at a very high price. But aside from printed technical information and test models of mining machines, the natural resource companies currently closest to seabed mining also have teams of highly skilled people with many years of experience in the problems of land-based mineral extraction. This would also put the agency at a serious competitive disadvantage unless, again, it tried to hire this human capital away from the private sector, by paying these people more than they are currently earning.

Starting from scratch, an international agency would be considerably less efficient than the firms that have already put millions of dollars and more than a decade into ocean mining, and it could eventually reach this technical efficiency only by bidding information and manpower away from the private sector through paying higher factor prices. The final result would, of course, be a higher cost structure than would have existed in private industry in the first place. The

question then becomes, would the increased cost of production faced by the agency be greater or less than the normal profit earned by the private firm? If greater, then the international community would have more dispensable funds available if it simply allowed free-access ocean mining and taxed the rent away. If less, then the international community should set up its own exclusive shop for the exploitation of seabed nodules.

This final section has attempted to identify the three basic interest groups in the ocean mining debate, suggest grounds for compromise and discuss some guidelines to encourage economic efficiency when the compromise is made. It was argued that, contrary to the opinion of some economists, taxing away the rent does affect output decisions. It was also argued that competitive bidding would be inadequate for capturing the rent, due to the small number of bidders and uncertainty over cost structures. A profit tax allows a sharing of risks between the taxpayer and the taxed but given the integrated nature of potential ocean mining firms, selection of the tax rate must be undertaken with an eye to the existing tax rate on the processing firms. Finally, it was pointed out that mining by an international agency would probably involve a higher cost structure than the private firms currently involved in ocean mining R & D due mainly to the technological and human capital disadvantage that would be faced by an international agency.

Conclusion

This paper has attempted to put ocean mining in a stimulus-response framework. It first tried to explain the stimulus to the current interest in ocean mining in terms of the rising value of ocean nodules, the falling cost of ocean mining and the rising cost of traditional land-based mining. It then devoted considerable discussion to the hypothetical short-run response of the economic system to the first generation of ocean mining. Seabed mining was described as a new technology which could gradually, over a very long period of time,

render land-based production of some minerals obsolete, though it is conceivable that ocean and land-based mining could coexist indefinitely. As for short-term effects, it was discovered that a very small number of countries stood to face measurable losses from free-access ocean mining. In some very worst-case (and unlikely) scenarios, Gabon, Zaire, the Dominican Republic, New Caledonia and Peru could face temporary declines in export earnings of up to 6 percent, 4 percent, 8 percent, 8 percent, and 8 percent respectively. In reaction to this hypothetical market response, the countries of the world have responded politically in attempting to redesign the institutional framework for allocating ocean resources in general and seabed minerals in particular. The final section of the paper attempted to identify the three basic interest groups, suggest areas of compromise, and suggest economic efficiency guidelines for implementing the compromise.

FOOTNOTES

¹Over the past decade U.S. dependence on outside sources has increased for only two of the four major nodule metals. Domestic primary production as a percent of primary consumption has fallen for both manganese (6.0 percent to 2.3 percent) and cobalt (8.5 percent to zero) between 1965 and 1974. This same ratio has changed little for either nickel (7.1 percent to 7.3 percent) or copper (83.8 percent to 81.8 percent) over that same period. Mineral Facts and Problems 1975, Washington, D.C.: U.S. Bureau of Mines, 1976.

²Nodule value deflated by the IMF Index is not shown in Figure 1, but it exhibits a pattern almost identical to the one shown using the Wholesale Price Index.

³See "Prospecting & Exploration Techniques for Ocean Resource Development," Mining Engineering, April 1975, pp. 36-41.

⁴Robert Sisselman, "Ocean Miners Take Soundings on Legal Problems, Development Alternatives," Engineering and Mining Journal, April 1975, p. 82.

⁵Conrad Welling, "Next Step in Ocean Mining -- Large Scale Test," Mining Congress Journal, December 1976, pp. 46-51.

⁶Welling, December 1976, pp. 50-51.

⁷"Deep Ocean Floor Mining -- First Generation Techniques are Here," Mining Engineering, April 1975, p. 50.

⁸John Pearson, Ocean Floor Mining, Park Ridge, N.J.: Noyes Press, 1975, p. 145. Author does not indicate whether this is in constant dollars or not.

⁹Conrad Welling, "Ocean Mining System," Mining Congress Journal, September 1976, 3rd page of unpagged reprint.

¹⁰Ibid, 3rd page of article.

¹¹Kennecott Copper, Annual Report 1975, p. 11, Kennecott's Nevada Mines faced a 22-percent ore quality decline in only one year; i.e., from 0.78-percent copper in 1973 to 0.60 percent copper in 1974. Op. cit., p. 10.

¹²Mineral Developments in the Eighties: Prospects and Problems, Washington, D.C.: British-North American Committee and the National Planning Council, 1977; cited in testimony of Conrad G. Welling before the Subcommittee on Mines and Mining of the Committee on Interior and Insular Affairs of the House of Representatives, April 4, 1975, summary p. 2.

¹³When producers also act as speculators, part of their income is derived from being better than average forecasters in an environment of general uncertainty, and thus they would actually prefer an uncertain over a certain environment.

¹⁴M.D. Hassialis, "Preliminary Economic Evaluation of a Ferromanganese Deposit," Inter-University Program of Research on Ferromanganese Deposits on the Ocean Floor, Washington, D.C.: Seabed Assessment Program, National Science Foundation, 1973, p. 353.

¹⁵See Nina Cornell, "Manganese Nodule Mining and Economic Rent," Natural Resources Journal, Vol. 14, No. 4 (Oct. 1974) p. 528 for the 9-percent estimate and Danny M. Leipziger and James L. Mudge, Seabed Mineral Resources and the Economic Interest of Developing Countries, Cambridge, Mass.: Ballinger 1976, p. 159 for the 112-percent estimate.

¹⁶Leipziger & Mudge, op. cit., p. 161.

¹⁷The Group of 77 acts as the negotiating organ for some 114 developing countries. The group is almost identical to the set of what are generally considered to be developing countries, though it excludes a few and includes some very wealthy oil-exporting countries. In the discussion to follow, the Group of 77 and the developing countries will be used interchangeably, and some statistics will be calculated for the 114 countries belonging to this group, since it is they who are considered to have a more or less unified bargaining position on the issues involved in redesigning the rules for use of the ocean.

¹⁸The four groups include: Deepsea Ventures (U.S. Steel, Union Miniere of Belgium with Tenneco holding the service contract), International Nickel Group (INCO of Canada, the German ARM group, and a Sumitomo-led Japanese group), Kennecott Copper Group (Kennecott, Rio Tinto Zinc of U.K., Consolidated Gold Fields, Noranda Mines and Mitsubishi), and Lockheed Group (Lockheed, Royal Dutch Shell and Standard Oil of Indiana).

¹⁹One firm, Deepsea Ventures, apparently plans to process a portion of its nodules on the Gulf Coast of the United States and send a portion to Belgium for processing.

²⁰Because manganese is an essential ingredient of steel production, it may be that U.S. Steel, one of the major partners in Deepsea Ventures, is trying to assure itself of a secure source of this metal.

²¹F. Gerard Adams, "Applied Econometric Modeling of Non-Ferrous Metal Markets: The Case of Ocean Floor Nodules," in William A. Vogely (ed.), Mineral Materials Modeling, Washington, D.C. Resources for the Future, 1975.

²²See James C. Burrows, Cobalt: An Industry Analysis, Lexington, Mass.: D.C. Heath and Company (for Charles River Associates), 1971.

²³Assumptions underlying this figure: 36 lbs. of manganese per short ton of steel (this is generous, some writers say average requirement is only 14 lbs.), 1974 wholesale price of steel of \$247.20 per short ton, and 1974 manganese price of \$290.26 per long ton.

²⁴A simplifying assumption here is that all land mines have similar cost structures. In fact, there is a whole distribution of cost structures for both land and ocean mining and these distributions could easily overlap. Thus the three scenarios are not quite as tidy as they are made out to be in the text.

²⁵The learning curve found its way from the engineering and the psychological to the economic literature in Kenneth Arrow, "The Economic Implications of Learning by Doing," The Review of Economic Studies, Vol. 29, No. 80, June 1962, pp. 155-173.

²⁶Salter argues that a rise in the price of labor relative to the price of capital is inevitable in an economy experiencing technical progress. This is because as wages rise, technical progress prevents production costs, and thus prices, of capital goods from rising proportionately. He estimated that wages did rise about 60 percent more rapidly than plant and equipment prices between 1930 and 1950. W.E.G. Salter, Productivity and Technical Change, Cambridge: Cambridge University Press, 1969, pp. 35-37.

²⁷"With the pioneering nature of ocean mining, the first one to three units are expected to have only about a 20 percent overall recovery efficiency. (Recovery efficiency refers to the percentage of nodules lying on the seabed which are actually recovered during mining.) However, the learning curve is predicted to be very steep, and subsequent units are expected to have approximately 35 percent overall recovery efficiency. Small evolutionary improvements in mining technology are predicted to result in an overall recovery efficiency of greater than 50 percent after the year 2000." Alexander F. Holser, Manganese Nodule Resources and Mine Site Availability, Washington, D.C.: Ocean Mining Administration, Department of the Interior, August 1976.

²⁸In 1973, Gabon's oil output had risen by 20 percent from the previous year's level and there were 13 companies searching for oil. Henry E. Stipp, "The Mineral Industry of Gabon," Mineral Yearbook 1973, Vol. III, Washington, D.C.: U.S. Bureau of Mines, 1976, p. 320.

²⁹ The fact that all first generation ocean miners are international consortia could mean that there are intra-consortium agreements to ship some of the processed metal to Japanese or Europe, thus displacing Japanese or European as well as U.S. imports.

³⁰ See, for example, "An Econometric Model of the Manganese Ore Industry," United Nations Conference on Trade and Development, Document TD/B/483/Add 1, April 1974.

³¹ H.J. Schroeder, "Copper," Mineral Facts and Problems 1975, Washington, D.C., U.S. Bureau of Mines, 1976, p. 309.

³² One important exception for whom UN data on total exports was unavailable is New Caledonia, a French territory just east of Australia. New Caledonia has produced about one-fifth of the world nickel supply in recent years, is the second or third largest producer behind Canada and sometimes the Soviet Union, and derives practically all of its export earnings from nickel. It is also considered to be a high-cost producer.

³³ Actually, even if a rent tax distorts, it may cause less distortion than other types of taxes and thus still be a conceptually preferred form of taxation. In this case the second question would still be relevant.

³⁴ For a comparison of tax structures across countries see George F. Kopits, "Taxation and Multinational Firm Behavior: A Critical Survey," IMF Staff Papers, November 1976, pp. 624-673; and Seymour Fiekowsky and Alvin Kaufman, "Mineral Taxation," in William A. Vogely (ed), Economics of the Mineral Industries, New York: American Institute of Mining, Metallurgical and Petroleum Engineers, Inc., 1976, pp. 673-682.

³⁵ Richard B. Norgaard, "Uncertainty, Competition and Leasing Policy," unpublished manuscript, Department of Agriculture and Resource Economics, University of California, Berkeley, pp. 21 and 26.

³⁶ A very specific form of this tax designed for natural resource projects is the resource rent tax, which pegs the tax rate to the project rate of return and has the advantage of guaranteeing producers some minimum rate of return before a tax is imposed. See Ross Garnaut and Anthony Clunies Ross, "Uncertainty Risks Aversion and the Taxing of Natural Resource Projects," The Economic Journal, June 1975, pp. 272-287.

³⁷ Even though an international agency would have a monopoly in nodule mining, it would not be a monopolist in any of the markets for component nodule metals and thus it would not be able to control through its output decisions either the metal prices or the derived prices of nodules. Its output decisions would thus be more like that of a competitive firm than a monopolist. However, to the extent that

control of the agency could be used for political as well as profit maximizing ends, the level of output could differ from the perfectly competitive case.

OCEAN MINING IN THE PACIFIC BASIN: STIMULUS AND RESPONSE
A COMMENT

Leslie V. Castle

I found Michael Gorham's paper of considerable value in lessening my ignorance about ocean mining. I was scarcely aware of the existence of manganese nodules until the 1975 Pacific Trade and Development Conference when the subject was touched upon in a paper by Francis Christy and Lew Alexander and, I might add, fixed in one's memory by Vladimir Yakubovsky.

Gorham sets out very concisely and clearly why, in his view ocean mining is capable of being part of the world economic scene within a few years. They are persuasive arguments, at least to the uninitiated, but my impression is that he is perhaps over-optimistic and tends to play down the manifold uncertainties, for example about location, size and concentration of deposits and about the mining and processing technology. One of the problems here is that the degree of uncertainty on the cost side may not be much further reduced until a full-scale commercial operation is mounted and the prerequisite for that may well be a removal of the political uncertainty about the institutional framework. In turn, the degree of cost uncertainty must place considerable constraints upon the choice of institutional framework. I will come back to this point in a moment.

Gorham is also rather optimistic about the effects of the development of ocean mining on existing producers. He refers in several places to "temporary" declines in earnings by various countries. However these declines may not be very temporary. With thin industrial structures and with rather poorly developed levels of human skills, alternative avenues of employment or of future development may not be easy to find within lead times of just a few years. Nonetheless this is not an argument sufficient to justify artificial barriers being

placed in the way of the development of cheaper sources of raw materials. It may be an argument in favor of structural adjustment assistance; though I see no particular reason, other than one derived from the particular context in which the issue is being discussed internationally, for distinguishing in terms of such assistance between one unfavorable effect of change and any other. The problem is simply part of the general question of development and development assistance. Even in the absence of an agreed international framework for ocean mining the adverse effects would need to be taken into account in international trade, aid and investment policy, especially by those developed countries which stand to gain most.

The need for an international institutional framework which Gorham discusses in the third section of his paper I see as much more a political than an economic issue. While there is no difficulty in accepting as a harmless piece of rehtoric the statement that ocean minerals are "the common heritage of mankind" this does not amount to accepting as an analytical proposition that they are a common property resource with the implication that economic efficiency requires the establishment of enforceable property rights in them by an international organization. On the surface of it, given what is known about the nature of the resource and of the technology required, free access even without the specification of property rights is unlikely to result in excessive investment and the consequent inefficient dissipation of all rent as we find in the case of ocean fisheries; nor should there be free-rider or claim-jumping problems leading to too little investment. The expectation of substantial rent implies very limited entry.

Thus, the main argument for some form of international framework is an equity (i.e., political) one: that because the resources do not lie within the acknowledged boundaries of any nation, the benefits should accrue to all nations and not simply to those who, for whatever reason, have the technological capacity to convert them from mere curiosities into actual resources about which choices can be made. I find the argument unconvincing, but what is more important is how that idea is translated via an international institution into an equitable

program of benefit sharing.

Gorham discusses a number of proposals in this context and I find myself in general agreement with his views. I agree in particular with his views on exploitation of the resources by an international agency and about the taxation of the economic rents that would be generated. While we may think we know what we mean when we talk about economic rent it is quite another thing to discover it and measure it in practice and to make the concept the foundation for an international taxation policy. Moreover, it may be that rent or excess monopoly profit (call it what you will) is the necessary large carrot to induce the investment. If it is to be taxed away there is no particular reason why resources should flow into this new technology rather than into less efficient existing land based mineral development. Further, there seems little justification for chasing after this particular source of rent and not others such as that from oil resources, except of course that most oil resources are or will be within the boundaries of some nation state. But that is a matter of historical or political accident, not of economic logic.

For my part, I believe that a preferable course is to leave the development of ocean minerals to those who know how, to leave the question of how those enterprises should be taxed to the nation state of which they are members, and to leave the question of distribution of benefits to negotiation between those countries and the international community at large. Failure to reach an international accord on this issue would be unfortunate not only because of its effects on developed/developing country relationships out of all proportion to the intrinsic importance of the issue in relation to world welfare, but also because it might foreclose on future possibilities of creating international institutions where they may really be needed, such as in ocean fisheries or in the exploitation of other unowned resources such as those of Antarctica.

OCEAN MINING IN THE PACIFIC BASIN: STIMULUS AND RESPONSE
A COMMENT

David V. Hudson, Jr.

1. Why Ocean Mining Now?

The author appropriately notes that the "deflated" value of nodules was no higher in 1975 than in the mid-1950's, and prices of copper and nickel have since fallen. So the stimulus must come from the cost side, and may be supported from the market viewpoint.

Costs

While no new technology is involved in nodule mining (like the nodules, the technology has been available), constant refinements and improvements in its application are to be expected. The "learning curve" will undoubtedly exist. (The first venture or two may suffer severely as the early lessons are learned.) But costs are relative. It appears that the cost of nickel and co-products (Cu and Co) may be lower from deep ocean mining than from alternative on-shore mining of laterite deposits.

The author notes the uncertainties of costs. Recent experience with major new applications of "old" technology gives one little comfort -- substantial cost overruns are a real risk, as experience in the Alaskan pipeline, the first liquified natural gas projects, North Sea oil platforms, etc., have shown.

One of the costs is the tax regime. Most studies assume taxes on deep ocean mining will be of similar impact to U.S. corporate income taxes. This variable is as great as any other, yet is often treated lightly.

The author notes the trend of both ore body locations and qualities to yield higher costs for land mining. This is true also in ocean mining -- the first sites to be mined will be those with the highest

metal values and best seabed mining conditions. Subsequently, the trend to higher costs will set in. Hopefully, as in the history of land mining, technological improvements will operate at least partially to mitigate these factors.

Land and sea mining will compete at the margin when new capacity is developed, with higher quality resources, when discovered, being attractive to mine whether on land or at sea.

Preliminary estimates indicate that nodule mining on a "project" basis may be very attractive versus alternate investments, if all the assumptions hold up.

2. The Economic Consequences of Ocean Mining

Gorham's assumptions regarding the impact of nodule mining appear directionally correct -- little impact on the very large copper market, some impact on nickel (particularly laterite mine development), and greater impact on cobalt. Manganese, if recovered, would have great impact.

Adams noted that his modelling of cobalt did not provide adequate linkage with nickel, and Gorham is correctly dubious of Adams' findings. Zaire's cobalt is a by-product (of copper) as is the nodule's. Other observers feel the price of cobalt would approach that of nickel, for which it is a substitute in many uses.

The world's consumers benefit any time the real resource cost of a product is reduced. The allocation of the savings may spread widely and thus thinly, and the producers may have the most apparent gain. The industrialized countries may gain most. But any reduction of the relative costs of capital goods is of vital interest to the developing countries.

The impact on land mining is more a question of slowing development of marginal resources rather than one of technology. Metals mining is ore-body critical and ocean mining is no exception.

However, the impact on existing mines is perhaps also overstated. The ocean mining ventures are likely to proceed slowly at first. By the time the economics are clarified, whether favorably or not

potential nickel-laterite projects will be advanced only after taking the impact of ocean mining to consideration. Existing ventures, having high capital costs, will tend to operate at nearly full capacity unless the price of nickel falls to cash costs. (And this is no different from the classic behavior of the copper gold and silver markets; ocean mining introduces no new factors, only potentially more supplies having lower marginal costs.)

As Gorham states, the likely impact on mining employment would be small at most -- probably less than he has estimated because the first few projects would not be started simultaneously as assumed in the model.

The trade pattern effects are clear, although the forecast for cobalt probably overstates the losses to Zaire.

3. Political Response -- Redesigning the Institutional Framework

First, I believe neither the "rents" or the "losses" would be as easy for one observer to define as suggested. Moreover, agreement among the nations would be enormously difficult.

A rent tax would affect decisions -- it becomes an upper limit on profits yet does not provide insurance against loss. A "rent" tax is assumed theoretically to tax away only the returns, not necessarily to induce economically-warranted investment. However, in the case of huge uncertainties, such as in the ocean mining of nodules, any limit on potential returns increases the possibility of losses. The chances would be that all the exploration, research and development, and pre-development costs would not be recovered as complete agreement is unlikely as to the scope of costs to be allowed.

Bidding may prove to capture more rent than exists -- witness the bidding on the Destin anticline off Florida. In conjunction with a profits tax it is perhaps the best mode. The concern over pricing practices of integrated companies is unwarranted. Governments have been dealing with companies effectively in this area for years. (While much could be said about the problems of development through an

international mining agency, it would also suffer from lack of a competitive standard of efficiency and there would be no assurance that this approach would maximize realization of "rents.")

By far the most important factor, however, is stability of the system of compensation. If 500 million dollars are to be risked on each venture, the participants will have to have assurance that the rules will not change after the investments are made. Moreover, the lesser the risk of changing rules of taxation, the lower the risk premium required for investment and thus higher bids for projects and more activity would result.

OCEAN MINING IN THE PACIFIC BASIN: STIMULUS AND RESPONSE
GENERAL DISCUSSION

Considerable discussion focused on the political aspects of ocean mining. A common heritage principle did not imply that ocean minerals were a common property resource, but there still might be important efficiency reasons, peculiar to ocean mining, for establishing and enforcing property rights. Gorham agreed that political uncertainty over international rules was a major obstacle to private investments, but noted that the Metcalf Bill before the U.S. Congress would remove most of this risk by guaranteeing compensation to U.S. companies for losses resulting from a treaty. Someone pointed out, however, that the guarantees covered only negotiated tradeoffs and were considered insufficient by the industry. Worries were expressed that passage of the Metcalf Bill might deter U.S. agreement on a treaty, or that unilateral action by the U.S. would breed unilateral actions of other nations, further aggravating political problems. Cautious optimism was expressed that the Law of the Sea Conference would reach agreement on an ocean mining regime by next year.

The resource rent tax question arose again. Garnaut stated that a pure rent tax, which only taxed profits in excess of those necessary to induce investment, was, by definition, allocatively neutral. On the other hand, the application of the U.S. tax structure to ocean mining was not a neutral solution, since distortion of markets for land-minerals would simply be carried over to ocean-minerals. Another participant pointed out that the theoretical literature on asset markets indicated that the costs of equity capital were independent of specific project risks, but related to a firm systematic risk position. Hence a resource tax would not effect resource allocation for existing technology, but would reduce the incentive for new investments. However, as a matter of practice, bankers do consider project risk in

approving loans. Still another participant thought that some positive marginal rent may be necessary to induce entry, and pointed, as a compromise proposal, to a tax being considered in Thailand, which would fix a constant positive marginal rent to private firms.

The impact of ocean mining on export earnings may not be temporary for structural reasons, but Gorham emphasized that even under worst case assumptions the impact on the third world would be modest, except for a few countries. Another participant thought that it was misleading to conclude that the unemployment impact would be small as a percentage of the national labor force, since unemployment effects would be regionally concentrated. Also some minerals are mined jointly, such as copper and nickel, and so cutbacks in the production of one mineral may affect other markets.

Some doubt was expressed about Gorham's conclusion that the impact of ocean mining on port infrastructures would be small. Gorham replied that what he meant was that the new infrastructure requirements would be small compared to those required for new land-based mines.

Gorham said that reports and conversations with industry officials on experimental operations led him to believe that profitable ocean mining was right around the corner if not already here today. But someone pointed out that, to date, industry had made only a small portion of the investment required for large scale operations and was waiting for a reduction in risks. Mining corporations wished to be number two or three in ocean mining, but not number one. Someone else remarked that there still are large technical problems to be solved.

Several participants commented that ocean mining would significantly change mining industry structure. Contrary to Gorham's assumption, they thought that the new technology would induce new entrants into the market. Also some marginal local enterprises which currently compete in markets for land-based minerals would no longer remain competitive. Since nodules contain a basket of minerals, forward integration of the industries might take place for marketing numerous by-products. On the question of whether there were any economic advantages to joint production, the major costs were getting the

minerals to the surface rather than separating them, except for manganese. On the question of whether nodules are an exhaustible resource, the ocean floor does reproduce nodules but it is not really known how fast or whether new nodules would be of the same quality as the old.

*** II. NATIONAL CASE STUDIES IN NATURAL RESOURCE PROBLEMS ***

Australia's Minerals Production and Trade: Case Study
of a Resource-Rich Developed Country

Ben Smith

Discussants: H. Edward English
Hang-Sheng Cheng

General Discussion

Options for a Resource-Poor Developed Country -- Japan
Yasuhiro Murota

Discussants: Hugh Patrick
Laurence L. C. Chau

General Discussion

Issues in the Development of Resource-Rich LDCs: Copper
in Chile

Ernesto Tironi

Discussants: Romeo Bautista
Danny Leipziger

General Discussion

Natural Resource Problems in a Resource-Poor Developing
Country: The Korean Case

Wontack Hong

Discussants: Francis K. Chan
Yashichi Ohata

General Discussion

AUSTRALIA'S MINERALS PRODUCTION AND TRADE: CASE STUDY OF A RESOURCE-RICH DEVELOPED COUNTRY*

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1. Introduction

Australia's rise to prominence as a minerals producer has been rapid, having really only commenced in the early 1960s. The rate at which mineral developments have taken place, and the generally remote locations of those developments, have created strains for resource allocation within Australia. While the mining industry argues that it is already disadvantaged by the existence of direct or indirect subsidies to other activities, arguments have recently been advanced favoring deliberate restraints on the growth of the mining sector in order to curtail the effects of unfavorable exchange rates on other traded-goods sectors.

Australia's growing mineral production and trade has been closely associated with Japan's recent rapid industrial growth. The high level of dependence of the two countries on one another in the minerals trade has raised important issues relating to price bargaining and the degree of government regulation of the bilateral trade in minerals. At the same time, the effects of rapid inflation, exchange rate changes, and the Japanese recession have placed strains on the degree of security provided by long-term trade arrangements, and these have stimulated consideration of the relative merits of alternative means of providing secure access to markets and supplies.

Partly because of the speed of development, growth in minerals production has depended heavily on foreign investment and substantial

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overseas loan financing. The nature of Australian policy towards foreign investment has been, and remains, an important determinant of the rate and nature of minerals developments and of the benefits to Australia from such developments. In the future, attitudes adopted towards foreign investment, as well as the manner in which the problems of maintaining security and stability in the trade are dealt with, may be an important influence on Japanese decisions about the transfer of inefficient processing activities out of Japan and about the appropriate location of those activities.

In recent years there has been a renewed interest internationally in the formation of producer cartels for a number of mineral products, in commodity stabilization arrangements, and in a reduction of barriers to trade in processed mineral products. While Australia has a clear interest in the last of these, its position as a developed country minerals producer has caused it to approach the questions of producer cartels and international commodity arrangements in a cautious and somewhat ambivalent manner. However, the Australian government has not appeared to discourage Australian companies from joining private international producer groups seeking to raise, or maintain, stable prices for mineral products.

Australia's rapid growth as a minerals producer has taken place during a period of growing concern over environmental and resource conservation issues. Although this has not as yet led to any great opposition to mining in general, in some instances there have been substantial conflicts of interest and the appropriate means of resolving such conflicts is an important policy issue.

In any discussion of Australian mineral developments it is important to recognize the major role of the various State governments in determining the rate and nature of mining developments and the conditions under which they may take place. Each State claims ownership rights over the mineral and energy resources within its territory, and, therefore, the direct power to regulate and to tax the exploitation of those resources. The Commonwealth (federal) Government only exercises regulatory powers over mineral and energy resources lying in federal territories or offshore.

Commonwealth control over mineral developments in the States arises indirectly through its powers over income taxation, over the conditions under which international trade may take place, and over the conditions under which foreign investment may enter the country. Frequently the Commonwealth is constrained by the Constitution not to discriminate between States, between activities, or between companies engaged in the same activity. The separation between State and Commonwealth responsibilities, and the constraints on the exercise of Commonwealth powers, have been argued to result in substantial difficulties and inefficiencies in adopting and administering appropriate policies towards the mining sector.

The next section of the paper reviews Australia's development as a minerals producer since the early 1960s, while the following sections provide detailed examinations of the particular issues raised above

2. The Development of the Australian Minerals Industry

Until the early 1960s the Australian minerals industry was dominated by the underground mining of coal for domestic use, the production of gold, and the mining, smelting and refining of copper, lead and zinc. Production of iron ore was limited to the needs of the well-developed but domestically-oriented iron and steel industry, and Australia was wholly dependent on imports of nickel, bauxite and petroleum products. In general, the principal developments of the preceding several decades had been a steady expansion of output from long-established mining areas and the growth of domestic processing of mine products, particularly of copper, lead and zinc.

In 1960, then, the mining industry was heavily concentrated around a few locations -- the coal mining area around Sydney and the mining towns of Broken Hill, Mount Isa, Kalgoorlie, and Mount Lyell -- where the necessary infrastructure and ancillary activities were fully developed. The direct contribution of mining to GDP was less than two percent, while minerals and primary metals accounted for only 6.5 percent of total exports. The principal export commodities, representing almost 80 percent of total exports of minerals and pri-

mary metals, were copper, lead, zinc and the mineral sands, rutile (titanium) and zircon.

As a result of a spate of mineral discoveries from the late 1950s onwards, the nature and importance of the Australian minerals industry has changed dramatically since 1960, and Australia has emerged as one of the world's major minerals producers (see Tables 1, 2, and 3). Exploration was stimulated by a number of factors. A variety of exploration incentives was offered, particularly for oil exploration, and the removal of long-standing embargoes on the export of iron ore and manganese ore provided a substantial stimulus to explore for these products. As the Japanese economy moved into sustained and rapid industrial growth, an obvious market emerged for a wide range of mineral products. By 1960, Japan was already taking over one third of Australia's minerals exports, and Japanese purchases of copper concentrates and coking coal, in particular, had given a significant boost to existing mining establishments.

The major discoveries resulting from the upsurge in exploration activity were of iron ore, black coal, bauxite, nickel, manganese, oil, natural gas and, more recently, uranium. With the exception of the oil and gas discoveries, where the domestic market has provided a secure basis for development,¹ the new deposits gave Australia a production potential far in excess of domestic requirements. Importantly, many of the discoveries were in remote regions away from established mining areas and their efficient development required major capital expenditures on new townships, transportation and port facilities. In order to raise the large capital sums necessary for development it was essential that secure export markets could be found for a substantial proportion of the projected output.

While the circumstances of Australia's minerals developments may have made secure market access particularly important, it is a general feature of the international minerals trade that producers have a strong interest in obtaining guaranteed long-term access to markets and that minerals consumers have a similarly strong interest in obtaining guaranteed long-term access to supplies. The importance of

Table 1: Share of Mining in Gross Domestic Product, and
Share of Minerals and Primary Metals in Exports:
Australia, 1960 to 1975.

	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1975</u>
<u>Mining GDP</u> ^(a) (%)				
<u>Total GDP</u>	1.87	1.92	3.57	4.50
<u>Mineral Exports</u> (%)				
<u>Total Exports</u>	6.56	10.60	26.83	34.63

(a) GNP in mining only -- does not include minerals processing.

Sources: Australian Bureau of Statistics, Overseas Trade Bulletin, A.G.P.S., Canberra, various issues.

Bureau of Mineral Resources, Australian Mineral Industry Review, A.G.P.S., Canberra, various issues.

Australian Bureau of Statistics, Australian National Accounts, A.G.P.S., Canberra, various issues.

Table 2: Shares of Commodities in Total Mine Production and Exports of Mineral Products: Australia 1960 and 1975.

	<u>% of Mine Production</u> ¹		<u>% of Mineral Exports</u> ²	
	<u>1960</u>	<u>1975</u>	<u>1960</u>	<u>1975</u>
Black Coal	35.0	29.9	10.1	23.9
Brown Coal	4.4	1.5	--	--
Crude Oil	--	9.6	--	0.5
Natural Gas	--	1.5	--	--
Liquid Petroleum Gas	--	3.2(e)	--	3.2(e)
Iron Ore ³	3.1	20.1	4.1	31.3
Tungsten	0.4	0.6	1.4	0.5
Nickel	--	--	--	5.5
Manganese	0.2	7.7(e)	1.0	15.0(e)
Bauxite	--	--	--	--
Copper	16.2	4.7	21.8	4.3
Lead	13.1	3.1	32.8	4.1
Zinc	4.9	4.4	13.6	3.8
Tin	1.3	1.2	0.2	1.0
Titanium	2.5	2.4	7.0	2.1
Zircon	0.6	2.2	2.1	1.8
Salt	0.6	0.7	0.2	0.5
Gold	<u>10.1</u>	<u>1.6</u>	<u>(a)</u>	<u>(a)</u>
TOTAL	92.4	93.3	94.3	97.5

Notes: ¹Value of mine production as a proportion of the total ex-mine value of Australian minerals production (excluding construction materials).

²Value of exports of ores and concentrates plus smelter and refinery products as a proportion of Australia's total exports of minerals and primary metals.

³Exports include exports of crude iron and steel -- there were no exports of iron ore in 1960.

(a) Export of minerals and primary metals calculated net of exports/imports of gold bullion.

(e) Estimate.

Source: Calculated from data provided in Bureau of Mineral Resources, Australian Mineral Industry Review, 1961 and 1975 (preprint).

Table 3: Australian and World Production and Reserves: Selected Mine Products

	Mine Production (1974)			Reserves (1975)		
	Australia	World	Aust/World%	Australia	World	Aust/World%
Black Coal	m. tonnes	2,290	3.1	19,500	532,000	3.7
Brown Coal	m. tonnes	820	3.3	12,600	233,000	5.4
Crude Oil	m.cu. metres	3,220	0.7	387 (a)	116,064	0.3
Natural Gas	m.cu. metres	1,345	0.4	815	72,010	1.1
Uranium	'000 tonnes	19	--	312	2,022	15.4
Iron Ore	m. tonnes	850	11.4	17,800	253,000	7.0
Tungsten	'000 tonnes	2.2	4.7	77	2,060 (b)	3.7
Manganese	m. tonnes	1.5	6.6	490	5,443	9.0
Nickel	'000 tonnes	46	6.3	2,000	45,000	4.4
Bauxite	m. tonnes	80	25.0	3,000	15,500	19.3
Copper	'000 tonnes	250	3.2	6,000	440,000	1.4
Lead	'000 tonnes	370	10.4	14,000	145,000	9.7
Zinc	'000 tonnes	463	8.1	19,000	119,000	16.0
Tin	'000 tonnes	10	5.5	332	10,160	3.3
Ilmenite	'000 tonnes	817	21.2	58,400	570,000	10.2
Rutile	'000 tonnes	319	91.1	9,200	13,000	70.8
Zircon	'000 tonnes	368	69.4	15,700	33,000	47.6
Salt	m. tonnes	4.9	3.2	n.a.	n.a.	n.a.
Gold	tonnes	15.9	16.4	156	40,400	0.4

Notes: (a) At import parity price for Australian crude oil.

(b) At a price of \$US30 per lb. Australia has about 27 percent of world reserves at a price of \$US 15 per lb.

Sources:

S.F. Harris (1976).
 Bureau of Mineral Resources, Australian Mineral Industry Review.
 U.S. Bureau of Mines, Commodity Data Summaries, 1977;
 Australian Institute of Petroleum, Oil and Australia, 1975;

such guarantees lies in the highly capital-intensive nature of both the mining and processing activities, with a high ratio of fixed costs to variable costs dictating continuous operation as close to full capacity as possible. In the absence of well-developed and relatively stable "free" markets, to which both producers and consumers would have ready access, it is often in the interests of both parties that the output of particular mines be tied, on a long-term basis, to the requirements of particular minerals users. For a large part of the world trade in many minerals this link has been achieved through ownership ties between metals producers and "captive" mines.²

However, although subsidiaries of European and North American companies had played a major role in the discovery of much of Australia's new resource potential, these companies had generally not been seeking sources of supply for their overseas parents. The distance of Australia from the North Atlantic market placed Australian mineral supplies at a severe transport cost disadvantage relative to existing supply sources, especially for unprocessed products, and the extent to which the basic requirements of European and North American minerals consumers were already met by investment ties or long-term contracts with established suppliers offered little short-term prospect for the scale of entry into the market necessary to develop some of the large Australian deposits.

As noted earlier, Australia's growing potential as a minerals producer coincided with the acceleration in Japan's industrial growth. Just as Australia's access to the North Atlantic market was limited by distance and by rigidities in existing trade patterns, so Japan's access to rapidly growing supplies of basic minerals from established sources was limited by the same factors. This substantial resistance to alternative directions in trade provided a strong incentive for the development of an intensive bilateral trade in minerals.

However, Japanese metals producers did not look to investment in Australian resource developments as a means of establishing a secure supply position. There are probably several reasons for this. Until 1971 there were severe governmental restraints on overseas investment by Japanese companies and, in any case, the rapid expansion of invest-

ment in metals production is likely to have meant that the metals producers were not able to spare funds for investment in resource developments. On the Australian side, where the holders of mining leases were seeking additional equity contributions, they were essentially concerned to obtain participation from companies with expertise and experience they did not themselves possess --in particular aspects of mining, in bulk materials handling, or in marketing. Significantly, in the few instances where there was any substantial Japanese equity this was taken by trading companies rather than metals producers.³

Although equity holdings by Japanese trading companies undoubtedly provided important links between some Australian minerals producers and Japanese consumers, their main purpose seems to have been to secure the rights to handle the trade with Japan and to share in mining profits, and they were not sufficiently large to affect the independence of Australian mining companies from Japanese purchaser interests.⁴

In the main, then, ownership ties with overseas processors were relatively unimportant in providing the guarantees of market access necessary for Australian mineral developments. Rather, the essential security for mining investments was obtained by the negotiation of long-term supply contracts with independent Japanese metals producers. Typically, these contracts were for the sale of unprocessed minerals and they extended over 10-15 years. The tonnage to be delivered in each year was specified (\pm 10 percent at the purchaser's option) and a fixed-dollar US price was set, subject to renegotiation within a predetermined range (\pm 7 1/2 percent in the case of iron ore) at intervals of 5 years or so.⁵

Such contracts were of fundamental importance in allowing a wide range of mining activities to proceed. Even in the case of bauxite, where Australia now has a quarter of the world's production and where Australia's trade has increasingly become integrated with the international operations of the major aluminum companies, initial mining developments were underwritten by long-term contracts negotiated with independent aluminum producers in Japan. In the cases of iron ore and coking coal, which together account for half of Australia's mineral and

primary metal exports, contract sales to the Japanese steel mills still account for three quarters of the export volume and few, if any, new projects appear capable of development until a firm contract has been negotiated.

As a result of the mineral developments since the early 1960s, the dependence of the Australian mining industry on exports, either of ores and concentrates or of processed products up to primary metals, has increased very substantially. As Table 4 shows, export dependence is very high for almost all of the major minerals. While the energy goods appear significantly less dependent on exports, the figures somewhat understate the role of export sales in the development of energy resources. The main growth in black coal production since 1960 has been due to the opening of the large open-cut mines in Queensland, which are almost wholly export-oriented.

Although natural gas production to date has been based on sales to domestic consumers, development of the extensive North-West Shelf field will require large exports of liquified natural gas to Japan and/or the United States. Similarly, whatever development of Australia's major uranium deposits takes place will be wholly dependent on export markets. Only in the case of crude oil is present and expected production insufficient to meet domestic requirements. In the absence of substantial new oil discoveries, Australia's degree of self-sufficiency in oil will decline from the present figure of about 70 percent after the early 1980s.

Sales to Japan currently account for half of Australia's exports of minerals and primary metals (see Tables 5 and 6). However, dependence in the bilateral minerals trade has not been a one-sided phenomenon. Australia supplies over a quarter of Japan's imports of mineral and energy products, excluding oil, and is the largest supplier of iron ore, coal, bauxite/alumina, and nickel for nickel metal production. The availability of supplies of a wide range of minerals from Australia played a major part in avoiding resource bottlenecks in Japanese industrial growth during the 1960s and early 1970s. To give one example, Japan's import requirement for iron ore increased by 163 percent between 1965 and 1970 and Australian supplies met 58 percent of

Table 4: Export Dependence of the Australian Mining Industry:
Major Products, 1960 and 1975.

% of Mine Production Exported as Ores and
Concentrates or Smelter and Refinery Products

	<u>1960</u>	<u>1975</u>
Black Coal	7.0	45.1
Brown Coal	0	0
Crude Oil	--	0.9
Natural Gas	--	0
Liquid Petroleum Gas	--	95.1 ^(e)
Iron Ore ¹	0	82.4
Tungsten	58.0	100.0
Nickel	--	97.0 ^(e)
Manganese	75.2	91.0 ^(e)
Bauxite	--	90.0 ^(e)
Copper	46.0	68.8
Lead	74.5	79.9
Zinc	64.7	61.3
Tin	6.5	48.7
Titanium	86.5	64.5
Zircon	100.0	79.0
Salt	<u>3.9</u>	<u>79.9</u>
TOTAL ²	31.7	57.2

Notes: ¹Proportion exported as iron ore or pellets only -- does not include iron content of iron and steel exports.

²Average found by weighting products by shares in total export value of mining production.

(e) Estimate

Source: Bureau of Mineral Resources, Australian Mineral Industry Review.

Table 5: Direction of Australia's Mineral Trade:
Proportion of Exports to Major Markets
by Value, 1960 and 1975.

	<u>1960</u>	<u>1975</u>
Japan	37.2	49.9
East and S.E. Asia	(a)	6.0
Pacific	3.0	1.7
United States	12.7	7.7
Canada	(a)	1.9
Other America	(a)	3.1
U.K.	30.1	6.4
EEC	9.0	14.9
Other Europe (incl. USSR)	(a)	5.3
India and Middle East	3.4	2.1
Other	4.6	1.0
TOTAL	100.0	100.0

(a) Included in "other"

Source: Bureau of Mineral Resources, Australian Mineral Industry Review, 1960 and 1975 (preprint).

this growth in demand.

From this general survey of the nature of Australia's minerals developments and the trade relationships established, we turn to a closer examination of some of the more important aspects of those developments.

3. Macroeconomic Influences and Structural Adjustment Problems

Over the decade to 1973/74, gross product in mining grew three times as rapidly as gross domestic product for the economy as a whole.⁶ Other things being equal, such rapid growth in one traded goods sector would be expected to affect adversely other traded goods activities -- directly through increased competition for resources, or indirectly through pressures on the balance of payments and the exchange rate.

The Australian mining industry is highly capital-intensive and, although mining employment has grown twice as rapidly as overall employment, the mining industry still employs less than 1.5 percent of the workforce.⁷ However, this somewhat understates the contribution of mining to employment. Because of the remoteness of many of the new mineral discoveries, labor has not only had to be attracted into mining itself but also into a wide range of service activities catering almost exclusively to the mining community. Thus, the total workforce of the Pilbara region of Western Australia, which has grown in step with the development of the large iron ore mines, is three times as large as the mining workforce in that region.

The highly capital-intensive nature of mining, and the rapid growth of mining output, have resulted in a disproportionately large share of private fixed capital formation being directed into the mining industry. During the past ten years gross fixed capital formation in mining has been about 40 percent of that in manufacturing, although mining still employs only one twentieth the number of people employed in manufacturing and contributes only one fifth as much to GDP. If the capital requirements of the mining industry had to be met from the Australian capital market alone, this would clearly have had enormous repercussions for the structure of the economy. Domestic capital would

have gained substantially at the expense of other factors, and capital-intensive activities (including a number of proposed mining ventures) would have been cut back. In fact, however, a large proportion of the capital needs of the mining industry has been met from outside Australia, both through equity investments and through the raising of long-term debt finance in Europe, the United States, and Japan.⁸

The main impact of mining developments on other traded goods activities has not come through direct pressures on domestic resource availability but through substantial effects on the balance of payments, the exchange rate and the rate of domestic inflation.

During the period 1960/61 to 1975/76 the real value of mineral exports grew at an average annual rate of 18.5 percent. A steadily rising annual growth rate through the early and middle 1960s exploded to over 30 percent per annum in the three years 1968-1971. Thereafter, mineral export growth fell to around 5 percent annually, reflecting the fact that the minerals developments of the late 1960s were reaching full production capacity.

The impact of the world commodity boom of 1972-1974 on real mineral export growth was smoothed by two important factors. Initial contract prices for coal and iron ore were fixed, so that the Australian exporters faced difficulties in obtaining price increases in the early stages of the boom. Thus, in 1973/1974, the real value of coal and iron ore exports increased by only 2.6 percent when the real value of other mineral exports rose by 34.1 percent. In the following year, however, the growth in export value for coal and iron ore was almost 40 percent, compared to 9 percent for other mineral products. The second important factor was the tendency for energy (and, therefore, coking coal) prices to continue to rise as the boom collapsed. This meant that, although the real value of exports of other mineral products was static in 1975/1976, coal export value rose sufficiently to provide an overall increase in the real value of mineral exports of 8 percent. At present, the continued recession in the Japanese steel industry in particular has halted real mineral export growth.

In addition to the substantial growth in export revenues, the heavy reliance of the mining industry on overseas sources of finance

played an important part in generating the large capital inflows experienced in the late 1960s and early 1970s. On a conservative estimate, overseas investment in the minerals industry has accounted for 40 percent of all new overseas investment (excluding undistributed profits) in Australian companies in the last ten years. In some years more than 50 percent of the foreign investment inflow has been directed to the mining industry. The significance of this can be seen if overseas investment inflows are compared to total expenditures on imports. In the last three years of the 1960s foreign investment was running at about 23 percent of the value of imports. This figure jumped to 33 percent in 1970/71 and 1971/72, before dropping sharply below 10 percent in the ensuing years.⁹

Both because of its rapid export growth and because of its high level of financing from overseas, the minerals industry was largely responsible for the substantial balance of payments surpluses recorded in the early 1970s. The expansion of mineral exports was not by any means unpredictable, since it derived essentially from a steady expansion of output from new mines to meet specific contract tonnages. Thus, it should have been possible for the monetary authorities to anticipate a good deal of the balance of payments pressures and to recognize the trade component as reflecting a permanent change in export capacity. The appropriate policy response would have been to revalue the Australian dollar (\$A) progressively through 1971. In fact, the exchange rate was held until December 1971 when the Australian government responded to the devaluation of the \$US by devaluing the \$A slightly against all currencies on a trade-weighted basis. The approach to the external payments surplus was to attempt to sterilize it by counteractive monetary policy. Although this strategy was partially successful until the end of 1971, it was unable to prevent a domestic monetary expansion which was large in historical terms. During 1972, monetary discipline was abandoned, although the external payments surplus continued and became increasingly inflated by speculative capital flows.

While the revaluation of December 1972 was necessary, it came more than 12 months too late. Australia was already firmly on the path

to external adjustment through rapid inflation. The continuing trade surplus after that revaluation reflected the strong rise in commodity prices, the temporary nature of which required caution in monetary and exchange rate policy. In that event, monetary expansion continued and the export surplus was countered by further revaluations and by a 25-percent cut in tariffs in July 1973. As Garnaut (1977, p. 24) has observed, it was destabilizing to act so strongly to lower the relative prices of imports late in the boom.

Since 1972/73 the balance of payments has moved into persistent deficit, although the lagged response of mineral export values to the commodity boom and the rise in energy prices have made the downturn less sharp than it would otherwise have been. While the recession has produced very high levels of unemployment, the legacy of the monetary and exchange rate policies of the early 1970s is a continued high rate of domestic inflation.

Although the 25-percent tariff cut and the revaluations of 1972 and 1973 were the most obvious manifestations of the rapid growth in mineral exports, they have been more than offset by the devaluations of the \$A in 1974 and 1976 and by recent increases in protection for manufacturing industries. Since mid-1970 the effective (trade-weighted) value of the \$A has fallen by just under 10 percent.¹⁰ Thus, the real effect of the rapid growth in minerals production and trade on other sectors of the economy has come through a relatively high rate of domestic inflation, which has not had to be offset fully by exchange-rate depreciations.

So far as the effects on other traded goods sectors of the economy are concerned, it makes little difference whether the growth of the minerals sector is reflected in an appreciating exchange rate or in a relatively high rate of domestic inflation. In one case the competitive position of these industries is weakened by downward pressures on prices, in the other by upward pressures on costs.¹¹

In a recent paper, Gregory (1976) has attempted to indicate the magnitude of the effects of minerals export growth on the rural export industries and on the import-competing manufacturing sector. Gregory's analysis seeks to estimate the relative price shifts against

domestic traded goods production necessary to maintain balance of payments equilibrium in the face of the emergence of the "new" export sector. These relative price shifts are expressed as "tariff equivalents" -- that is, the alteration in tariff levels which, in the absence of the minerals developments, would have had the same effects as minerals export growth has actually had. Thus, assuming plausible elasticity values, he estimates the effect on the rural export industries as equivalent to a doubling of all import duties since 1964/65, while the effect on the average import-competing manufacturing industry is estimated as equivalent to the abolition of all tariffs and the imposition of a slight import subsidy.

The major limitation of the Gregory analysis is that it implicitly assumes that all adjustments to the strong minerals export growth comes through price effects, rather than income effects. To the extent that the income growth resulting from minerals developments increases demand for traded goods, the size of the relative price shifts necessary to maintain balance of payments equilibrium is correspondingly reduced. On the other hand, the Gregory analysis takes no account of the inflow of overseas capital associated with mining developments. In so far as this is not used to import capital equipment, it increases the short-run pressure on relative traded/non-traded goods prices, although remission of profits and interest overseas reduces the long-run pressure for structural adjustment.

Overall, it would be hard to object to Gregory's central thesis that the relative price effects of the rapid growth in minerals exports on other traded goods activities have been substantial.¹² The problems lie not so much in that conclusion but in the interpretations and inferences which have been drawn from it. Particularly at a time of high unemployment, the "Gregory Thesis" was bound to be cited as evidence of the need to strengthen protective trade barriers.

Rational discussion of the "Gregory Thesis" has centered on whether the relative price effects of rapid growth in minerals exports require structural adjustments in the rural and manufacturing sectors which are beyond the capacity of the economy to handle. In this context, Australia has been seen to be in a similar position to Norway,

which is deliberately restricting the rate of oil developments because of the limited capacity of the economy to adjust to a large increase in export revenue.¹³ It is ostensibly reasonable to argue that rapid income growth from one sector which uses relatively little labor may be undesirable if it necessarily results in the under-utilization of resources elsewhere in the economy, especially if that income growth derives from the exploitation of exhaustible mineral deposits whose real values may be expected to rise over time.¹⁴ However, in a period of high general unemployment, and in the total absence of any sensible strategy aimed at facilitating structural adjustment, it is impossible to draw any conclusions as to the true capacity of the economy to adjust to growth of the mineral sector.

A policy of restraining mineral export growth, if adopted under present circumstances, would be likely to retard structural adjustment both by reducing the private stimulus to reallocate resources and by reducing the pressure on governments to formulate policies aimed at assisting such reallocation. In that sense, advocacy of mineral export restraint has the same ostrich-like quality as arguments for increased tariff protection.¹⁵

Both the Gregory analysis and recent projections using the IMPACT model of the Australian economy¹⁶ suggest strongly that structural change in the manufacturing and rural sectors is essential if Australia is to reap the full benefits from its mineral wealth. The primary policy response should be concerned with achieving that structural change as quickly and smoothly as possible, while assisting those who are necessarily disadvantaged. It is encouraging that the Industries Assistance Commission has embarked on studies of the nature and problems of structural change.¹⁷

Once serious efforts are made to accommodate the impact of minerals export growth, it may be found that it is not possible to achieve structural adjustments at the rate required. In that case, the question will again arise whether it is desirable to allow minerals developments to proceed unhindered. Broadly, there appear to be two ways in which structural adjustment pressures can be reduced to a manageable level. One is to restrict the rate of growth of minerals

exports, which would involve the cost of postponing real income gains. To the extent that Australian minerals developments are closely linked to Japanese import requirements, it may not be possible to determine the timing of developments independently of Japanese needs. Thus, restrictions on the rate of development may involve losses of potential real income gains, rather than their postponement. The alternative strategy is to allow minerals developments to proceed unhindered, but to slow down the relative price effects on other sectors by temporarily "recycling" part of the external surplus generated. This strategy would seem to have particular attractions where, as has been the case in the past, minerals developments are heavily bunched in particular periods and where they are accompanied by a substantial temporary increase in net capital inflow. Then, temporary "recycling" may allow pressures for structural adjustment to be spread more evenly over time and to reflect long-term comparative advantage conditions. However, the argument needs to be interpreted carefully. The relative price effects of minerals growth impinge not only on the rural and manufacturing sectors but also on the mining sector itself. Thus, a recycling strategy which goes beyond that outlined above and which seeks to reduce long-run adjustment pressures on the rural and manufacturing sectors will result in a more rapid growth in minerals production than Australia's competitive position warrants.

Essentially, the nature of the problems caused by minerals developments depends on assessments of the likely future rate of growth of minerals exports. Much of the discussion of the "Gregory Thesis" has been predicated on the assumption that minerals growth will be very rapid in the future. Although there are a number of new mining projects in the pipeline, simultaneous development of which would result in a short-term mini-boom in minerals production and export, it seems most unlikely that minerals exports will grow over the next 10 to 20 years at the sort of rates experienced in the past. Importantly, an increasing dependence on imported oil after 1980 will tend to offset the balance of payments effects of continued expansion of minerals exports. The basic problems of structural adjustment may not be outside the capacity of the economy to handle so long as the problems

are not allowed to accumulate until they become insurmountable.

4. Federal and State Regulation of Mining and Related Issues

Australian mineral and energy deposits are mined under leases acquired from State governments or from the Commonwealth, depending upon their location. Exploration leases are generally granted on a short-term basis, and their renewal usually requires evidence that a sufficient exploration effort is being maintained. Production leases are often very long term,¹⁸ but they invariably stipulate that a particular capital expenditure and production program be undertaken. As part of the lease conditions, companies have often been required either to establish processing facilities by a certain date or to undertake costly studies of the feasibility of processing. Also, it is normal for royalties to be set at lower rates where minerals are processed locally rather than exported.¹⁹ The nature of these lease provisions illustrates the emphasis which has been placed by the governments concerned on short-term employment and income generation, either directly from mining or through the establishment of processing activities. While it might be thought, a priori, that the lack of tenure of mining companies, unless they are actively engaged in exploration or mining, would lead to a more rapid exploitation of mineral deposits than is optimal, this effect may be offset, for exploration at least, by the tendency for company taxation to discriminate against risky undertakings.²⁰ Also, the major minerals produced in Australia are those for which there are relatively long-lived world reserves, so that the exhaustion rents lost by any current over-exploitation would generally be small.

Provision of Mining Infrastructure

A feature of most Australian mining developments has been that the heavy infrastructure costs have been borne almost wholly by the mining companies. Aside from provision of such services as police, schools and hospitals, the relatively impoverished State governments, in particular, have seen mining as a means of achieving decentralization

and employment objectives at no cost to State revenues.

The question of whether, and to what extent, assistance should be given with infrastructure costs is of considerable importance. Evidence submitted to the I.A.C. suggests that around 25 percent of all mining investment has been devoted to infrastructure items, and the proportion has been much greater for the more remote developments.²¹ The choice between alternative mine developments is presently heavily influenced by infrastructure costs, and any significant government assistance with those costs would not only increase the viability of proposed projects generally, but would also influence the choice between alternative projects.

Although the mining companies argue that mining infrastructure should attract the same degree of public provision as infrastructure elsewhere in the economy, there is clearly no general case for this. In deciding whether to provide a particular item of infrastructure, public authorities ought to assess whether the users would be prepared to pay for it. In areas of diverse economic activity many infrastructure items have important public good characteristics, so that it is inappropriate to charge for their provision.²² By contrast, most mining infrastructure is used only by the mining company concerned (including employees and activities associated with the mining project), so that it would only be appropriate for the state to provide a particular item of infrastructure if the company would itself have been able to provide it without making the venture unprofitable.

While there is no general case for public provision of mining infrastructure, there are clearly instances where an element of subsidy is justified. To the (probably very limited) extent that roads, etc., built by mining companies provide benefits to the community at large, and not simply to those people associated with the mining activity, the state should provide an element of subsidy for their construction. Also, where mining developments in remote areas have the effect of easing congestion in urban centers, those mining developments provide external benefits which might appropriately be compensated for by assistance with infrastructure costs. Finally, where a number of community services, and such items as housing, are subsidized

in other areas from general government revenues, rather than from local taxes and rates, the same subsidies should apply in mining towns. Clearly this already happens with services such as police and schools, but the full range of government support is not available to some of the new mining towns in remote areas.

A separate argument advanced relates to the terms on which finance should be provided for infrastructure investments. It is suggested that the large sums involved make it difficult for companies to raise sufficient loan finance on appropriate terms, so that they may be faced with high interest charges or repayment schedules which do not reflect the long-term nature of the projects. The argument, then, is that governments should either provide relatively cheap, long-term loan finance themselves, or should provide guarantees which would assist companies to raise such loan finance.²³

The argument for government loans or government guarantees has centered on the degree of risk associated with mining projects and has implied the existence of imperfections in the private capital market's attitude to risk. However, while it is probable that the small Australian capital market is myopic and excessively risk averse, there is no obvious reason to believe that this is true of the wide capital market to which the major Australian developments have had access.²⁴ Essentially, the ability to raise large loans has depended on the security offered by long-term sales contracts and on the credit standing of the companies associated with projects. Only to the extent that these factors do not appropriately indicate the risk attached to financing particular project developments is there any case for government assistance with loan financing.

Current uncertainties as to the value of long-term contract arrangements²⁵ and the rapid increase in the costs of new mine and infrastructure development appear to have made large-scale loan finance both more essential for developments to take place and more difficult to obtain. Thus, project developments increasingly seem to depend on the availability of loan finance from the Export-Import Bank of Japan, channelled through Japanese trading companies or raw materials purchasers. In that situation, both Australian minerals

producers and Japanese bankers have a tendency to feel that assistance with loan financing should not be the responsibility of Japan alone but should also be borne, in some part, by governments in Australia. This apparently equitable suggestion has limited appeal. The fact that Japanese loan finance is available on concessional terms reflects a Japanese desire to reduce risks associated with possible future supply shortfalls. To the extent that provision of such finance to a project is perceived as strengthening the value of contractual guarantees, it should also make it easier for Australian producers to raise loan finance elsewhere. By contrast, Australian government assistance in the provision of loan finance would have no impact on the overall risk associated with project development, but would simply transfer some part of that risk from the mining company to the government.²⁶

Although there may often be a valid case for some form of government assistance with the provision of mining infrastructure, the level of external benefits deriving from mining developments will vary widely from project to project and those benefits are most likely to be felt in the State in which the project is located. Thus, it seems appropriate that the problems of determining and granting assistance should be dealt with by State governments on a case-by-case basis, rather than through any general attempt to subsidize infrastructure costs by the Commonwealth Government. However, rather than providing a solution, this sort of "first-best" observation merely throws the question of infrastructure assistance into the problematical arena of Federal/State financial relationships.

Taxation of Economic Rents from Mining

With the exception of a particular case to be discussed shortly, the main method whereby the owners of resource deposits (State and Commonwealth governments) seek to extract the economic rent from exploiting those deposits is through the imposition of royalties. Although royalties are sometimes related to profitability, they are generally set as a fixed payment per unit of output or as a proportion of sales value. In the wide variety of royalty arrangements operating,

Livingstone (1977) has observed that "there is little trace of consistency from State to State and little evidence of the rationale whereby individual States have arrived at their methods and rates of royalty." For example, the initial royalty rate on bauxite for export was 10 cents per ton in Queensland and 30 cents per ton in the Northern Territory, although the grade of ore and production costs would not have favored the latter. Recently, the Queensland royalty jumped sharply to a \$A 1 per ton, while the Northern Territory rate remained unchanged.

The fact that royalties are set in a manner which affects marginal costs or marginal returns means that there is often an incentive for "wasteful" resource exploitation and under-investment. As the values of many minerals have risen, and royalty charges have correspondingly increased, the marginal disincentive effect has tended to strengthen. Although it is possible, in principle, for different royalty rates to apply to different projects, this is often administratively difficult for State governments so that they tend to prefer uniform rates within the State. Thus, the marginal disincentive effect not only affects the management of deposits which are developed, but also deters investment in deposits which would not, in the absence of royalties, be considered marginal.

In addition to the levying of royalties, it has been argued by the mining companies that the State governments impose quasi-taxes through high charges for provision of various services. In most cases the evidence on this is unclear. However, there is no doubt that the Queensland Government uses rail freight charges as a means of extracting economic rent from mining activities. Companies are required to lend the State Government the finance necessary to build rail links between mine and port, and these loans are repaid with nominal interest from the freight revenue received. Since debt service is conditional upon the amount of revenue received, the arrangement effectively allows the State to make riskless investments in rail links. Thus, any freight charge in excess of the amount necessary to cover operating costs, economic depreciation, and debt service results in "pure profits" accruing to the State government.

This method of transferring rents from mining is essentially equivalent to the imposition of a unit royalty per ton shipped, and has the efficiency defects common to other royalty arrangements. From the viewpoint of the Queensland government, however, it has the advantage that the actual royalty paid through high freight charges does not appear as government tax receipts in the budget accounts and cannot readily be identified. This has advantages in bargaining over Commonwealth/State revenue sharing.²⁷

During 1975, the Commonwealth Government became concerned at large profits being earned, in particular by a US-owned coal company. In an attempt to claim back some of the rent from that company, the Commonwealth imposed taxes on the export of coking coal. Although these taxes were tailored to some extent to the grade of coal exported, their general non-discriminatory nature meant that a number of companies not earning large profits were adversely affected. Also the existence of the tax had a significant impact on the development of new mines.²⁸

In recent years there has been a growing interest in academic circles in the use of taxes on economic rents themselves as an alternative to the inefficient and often arbitrary application of royalties and export taxes (Garnaut and Clunies-Ross, 1975; Garnaut, 1977b; Swan, 1976, 1977; Smith and Ulph, 1977). The essential proposition is that, above some threshold rate (or rates) of return on funds employed, mining companies should be subject to an excess profits tax at a relatively high rate. In principle, the threshold rate of return should incorporate an appropriate margin over the market rate of interest to allow for risk (and for the fact that incomplete loss-offset provisions are provided) and any profits in excess of that threshold would be taxed at a rate of 100 percent. In practice, a number of difficulties arise: the rate of excess profits tax must be sufficiently below 100 percent to provide a continued incentive to efficiency; the inability to define accurately the appropriate threshold rate is likely to lead to wasteful investment or to underinvestment; the question arises whether the tax should be imposed on a

project-by-project basis or incorporated in a general way into the company tax system in cases where some activities or projects are more risky than others. Various alternative views are taken as to the appropriate formulation and administration of a resource rent tax arrangement, but the area of disagreement is, in fact, relatively minor.

Although the Industries Assistance Commission (1976a) initially dismissed of the resource rent tax concept, it was forced to consider the issue more seriously in its Report on Crude Oil Pricing (1976b). For a number of years the price of Australian crude has been held below import parity, and the I.A.C. recommended that this practice cease. There were three reasons for that recommendation. First, import parity pricing would bring Australian consumption of oil into line with the true opportunity costs of oil consumption. Second, import parity pricing would increase Australia's economically recoverable oil reserves by about 20 percent. Third, although production from new discoveries is already priced at import parity (less a \$A 2-per-barrel levy accruing to the Commonwealth), in the absence of a clear commitment to import parity pricing the industry was faced with uncertainties which slowed down exploration.

While the arguments for import parity pricing are overwhelming in efficiency terms, the consequence would be a windfall gain of about \$A 1 billion to the oil producers, a large part of which would accrue to overseas interests. Thus, the I.A.C. suggested the possibility of imposing a petroleum rent royalty, along the lines of the resource rent tax proposals, in conjunction with the relaxation of price controls. Although there appear to be strong arguments for imposing a resource rent tax in the context of the crude oil pricing decision, there is no difference in principle between a situation in which producers gain large profits because of a relaxation in price controls and one, such as coal, where they have gained similarly large profits because price was not controlled in the first place.

Despite the practical difficulties associated with the implementation of a direct tax on economic rents from mining, there is little

doubt that such a tax would be substantially more efficient in extracting rents as and when they arise than the present royalty and other charges. The major difficulty again lies in the division of responsibility between the State and Commonwealth governments. While it would clearly be preferable for resource rent taxes to be incorporated into the Commonwealth system of company taxation,²⁹ the States will want to guard jealously their right to raise revenue independently of the Commonwealth.

Environmental Problems and Control

Historically, control over the environmental impact of mining developments has rested with the State governments concerned. The controls exercised have been regulatory rather than fiscal, and mining has either been forbidden (in rare instances) or has been permitted to proceed subject to the company fulfilling conditions for management and rehabilitation of the environment. In general, State controls have not been very forceful, and the procedures for investigating potential environmental damage have not been thorough.

With the growing level of concern over environmental issues, the Commonwealth Government passed an Environment Protection Act in 1975. This reflected the fact that the adverse environmental effects of some mining developments were felt not only in the State in which mining took place but also in the Australian community generally, and the view that the State governments did not give sufficient weight to environmental damage. Although the Commonwealth Government has no direct power to control the exploitation of mineral resources in the various States, its power to control exports provided it with the authority necessary to enforce its environmental legislation.

The division of powers and the different interests of State and Commonwealth Governments over environmental issues have come most sharply into focus in relation to mineral sand mining and, in particular, in the case of sand mining on Fraser Island. After its own investigations, the Queensland Government granted mining leases subject to a number of conditions relating to management and rehabilitation. However, at the urging of the Commonwealth Department of the

Environment, export licenses were granted for only some leases and on an interim basis³⁰ pending an inquiry by a Commonwealth Select Committee. Eventually the Committee recommended that mining should be limited to beach areas below the high water mark and that mining of dune areas should be terminated.³¹ This recommendation was accepted by the Commonwealth Government and existing export licenses were not renewed. Compensation was paid to the Queensland Government on behalf of local people whose incomes had been adversely affected by the decision. However, the Queensland Government remained vigorously opposed to the decision to cease mining.

The division of powers, and the different biases in evaluation of environmental issues of the Commonwealth and State government, have generated substantial uncertainties for exploration investments. In part, these uncertainties are a transitional problem in that companies which have been accustomed to obtaining automatic rights to mine any deposits discovered will, in future, take greater account of likely environmental resistance in determining worthwhile areas to explore. However, considerable uncertainty must surround such assessments in a situation where there are no reasonable guidelines and where political relations between governments are likely to determine the nature of the bias in policy decisions.

A further unsatisfactory aspect of the present procedures is that Commonwealth control over environmental matters depends on the restriction of sales to consumers overseas. Although this is in fact not very different from direct control of production, given the heavy export dependence of Australian mining, it has the unfortunate appearance of discrimination against foreign purchases in protecting the Australian environment. Where the Commonwealth intervention comes after the negotiation of export sales contracts, uncertainties are generated about Australia's reliability as a supplier.

So far conflict over environmental issues has arisen importantly only in respect to mineral sands and uranium, and uranium is an unusual and special case. Australia is fortunate in that the large land mass, and the relatively remote locations of many minerals developments, permit mining to take place without imposing substantial environmental

damage. Thus, it is unlikely that environmental considerations will impose serious constraints on future resource availability from Australia. However, as the level of environmental consciousness increases, and as greater concern is directed to issues such as aboriginal land right, it is probable that conflicts of interest will become more widespread. In order to maintain consistent policy with respect to environmental aspects of minerals developments, it is important that Commonwealth and State governments seek means of exercising a joint authority which satisfies the interests of both. It is likely that this would result in a greater flexibility of approach to particular problems, so that a wider range of outcomes could be examined.

Company Taxation

The main source of Commonwealth Government revenue from mining is from the collection of company profits taxes. Until 1973/74, the mining industry received substantial concessions in the taxation of company profits. These included depreciation allowances on items of capital expenditure which would not be allowable elsewhere in the economy (mainly infrastructure items), immediate or greatly accelerated write-off for a wide range of capital assets, and exemption from tax of one-fifth of the profits earned from production of a number of "prescribed products" (including bauxite, mineral sands, copper and nickel). Also, deductions against personal income tax were, in some circumstances, allowed on subscriptions paid for new mining shares, with the recipient company foregoing the possibility of receiving future depreciation allowances in respect to the investments financed by such subscriptions.

It has been estimated that the cost of shareholder deductions to Commonwealth revenues was about \$A 200 million between 1967/68 and 1972/73, while the cost of the company tax concessions has been estimated at about \$A 480 million allowing for future payments of deferred tax.³² Actual tax paid by the mining industry in this period was only \$A 263 million.

Though the various calculations of the cost of the tax concessions

tend to overstate both the cost and the extent to which the concessions actually constituted favorable (non-neutral) treatment of the mining industry, there is no doubt that the company tax provisions for mining during the 1960s and early 1970s provided a substantial encouragement to the industry and were relatively favorable by international standards.

During 1973 and 1974, the most important concessional elements in mining industry taxation were removed and, in some respects, tax treatment of the industry swung in the opposite direction. This had a substantial effect in slowing down exploration and mining developments.

Following a Report by the Industries Assistance Commission (1976a), the tax provisions were again amended in 1976. The Report had based its recommendations on the principle of preserving neutral tax treatment between the sectors of the Australian economy. For example, it was accepted that items of infrastructure which, because of the remote locations of many mining activities, could be expected to have no value at the end of the mine's life should be allowed as depreciable assets, even though they would not be so allowed in other activities.

In general, as a result of the 1976 tax changes, the mining industry is now taxed on an equivalent basis to that applying for other sectors of the Australian economy. There appears to be some element of favorable treatment in the rate of depreciation allowed on mine development expenditures, but this would not be very significant. The main area of difficulty now is in the treatment of exploration expenditures for tax purposes. An important feature of exploration is the high level of risk associated with the activity. Given that company taxation penalizes gains but does not subsidize losses unless those losses can be set against profits elsewhere, it discriminates against activities in which the risk of loss is relatively high. In the Australian context, expenditures on petroleum exploration can be set against income from any source, while minerals exploration expenditures can be set against income from (non-petroleum) mining only. The effect of this is for the tax system to discriminate against minerals

exploration, except where it is conducted by companies with sufficient Australian mining income to take advantage of the loss offset provisions. For those companies, however, the question then arises whether successful exploration expenditure should be treated in the same way as unsuccessful exploration expenditure. At present both are immediately deductible against eligible income but, as Swan (1977) points out, successful exploration results in the creation of a capital asset which should be depreciated over its economic life. In general, then, it is not possible to assess whether the tax treatment of exploration acts as an incentive or deterrent, but it is clear that it discriminates against small exploration companies and against non-mining companies. This may actually have some advantages in that smaller exploration companies may be relatively inefficient and there are some suspicions that, in the period when shareholder deductions allowed small companies to attract funds relatively easily, significant misuse of those funds occurred.³³

Overall, then, Australia's taxation provisions for mining have moved, in a relatively few years, from being favorable by international standards to the point where there is now almost no incentive element. By comparison with most other countries, Australia's company taxation provisions for mining would not rate as being relatively harsh.

5. Foreign Investment in the Australian Mining Industry

As has been remarked earlier, the rapid growth of the Australian mining industry has been heavily dependent on foreign investment. In 1963, foreign ownership of the industry accounted for 27.3 percent (of which UK held 16.3 percent and US 9.2 percent) of the total equity, and 36.8 percent of the industry was under foreign control. By 1974/75, foreign ownership had risen to 51.8 percent (UK 11.6 percent, US 28.7 percent) and foreign control to 58.9 percent.³⁴

During the late 1960s and early 1970s, foreign investment came under increasing criticism and suspicion. In part, McKern (1975) attributes this to the fact that projects had passed "from the stage of great uncertainty and high perceived risk to that of stable, profitable

production, when the earlier risk-bearing role of the investor may be forgotten." Important, also, was the view that substantial tax concessions had been enjoyed by the mining industry, which allowed foreign investors to obtain greater benefits from mining than their contribution warranted.³⁵

Although there were some attempts during the 1960s to achieve greater Australian ownership, no significant restrictions were placed on foreign participation in mining until the advent of the Labor Government in late 1972. The Labor Government adopted a tough stance on the issue of foreign ownership and control, and sought in a number of ways to assert greater Australian control, to encourage greater Australian ownership, and to reduce concessional treatment of the mining industry generally. However, no coherent set of policies had been developed by the time the Labor Government was removed from office in late 1975, and the principal policy plank which the new government inherited and maintained was a guideline requiring companies developing new resource projects to seek 51 percent Australian equity.³⁶

However, whereas the Labor Government had placed a rigorous interpretation on the Australian equity requirement, with the result that a number of proposed developments had been held up, the new government has been prepared to interpret the guidelines more liberally and more flexibly. Thus, for example, one large new coal project has been allowed to proceed with Australian equity equivalent to a majority interest in the project being taken as a minority interest in the overall operations of the foreign controlled company concerned.

The simple desire to see Australia's resources managed by Australians cannot be dismissed as mere chauvinism. Clearly there are real benefits associated with the satisfaction of nationalistic sentiment, for which some costs will rationally be accepted. However, there is a considerable difference between seeking majority Australian ownership and seeking Australian control of resource exploitation. Unless established Australian companies are able to gain dominant shares of new projects, control is likely to remain firmly in the hands of the principal foreign participants. Given that there are really only three Australian companies with the experience and financial resources

necessary to take up this role, it can be seen that any significant alteration in the degree of foreign control of the mining industry in the short term would require either a very substantial restriction of the rate of development of the mining sector or large scale government participation in the industry.

Aside from nationalistic sentiment, there are two sorts of objections to foreign ownership and control which require consideration.

(i) Foreign companies may earn excessive profits, which accrue to overseas residents, from the exploitation of Australian resources.

(ii) Foreign companies may be able to avoid Australian taxation of their profits by adopting various transfer pricing strategies.

In the absence of transfer pricing problems, it is possible to ensure that excessive profits do not accrue overseas from the exploitation of Australian resources by pursuing appropriate taxation policies. As already mentioned, Australia's company taxation arrangements now provide very little in the way of favorable treatment for the mining industry. However, the levying of a flat rate of profits tax cannot prevent large profits accruing overseas where the deposits mined are capable of earning high rents. Given the high degree of foreign ownership of the Australian mining industry, failure to exercise state property rights efficiently through the adoption of a resource rent tax arrangement may result in much of the potential benefit to Australia from natural resource exploitation being lost.

Clearly, adoption of taxation arrangements designed to allow "reasonable returns" to foreign equity will only resolve the problem if foreign companies are not easily able to avoid payment of Australian tax. The fact that most of the overseas investment in the Australian mining industry has come from the US and Europe, whereas the bulk of the output is sold to independent companies in Japan, means that there are limited opportunities for foreign companies to transfer profits to overseas affiliates by concessional pricing of export sales. The major exceptions are in the trade in alumina, where Australia's production

and marketing are tied closely into the operations of the major international companies, and industrial salt, where Japanese interests control a number of Australian producer companies. In both of these cases, the Australian government has associations with other producer nations, which are the subject of a later part of the paper.

At the present time, then, the sorts of transfer pricing problems faced by Australia are generally more likely to be related to the terms by which loan finance is supplied and to royalties and fees for technical services provided by overseas parents. While it is relatively easy to police the former, by simple comparisons with known international lending rates, the appropriate fee for particular technical services is extremely difficult to determine. Perhaps the most expedient approach is to disallow such royalties and fees as deductions against taxable income.

Given that it is extremely difficult for taxation authorities to monitor, and set standards for, the prices at which commodities are transferred within multinational enterprises, there might be some real grounds for concern if the extent to which exports are sold to overseas affiliates were to increase significantly. The main way in which this would be likely to occur would be through increased Japanese equity in Australian minerals production. However, this does not suggest any need for restrictions on Japanese investments per se, but rather a caution in allowing controlling interests in resource projects principally designed to supply the Japanese market to pass into Japanese hands. In fact, although there seems to be a growing Japanese interest in equity participation in Australian resource developments, there is no sign of a desire to acquire sufficiently large equity interests to provide any degree of control. Thus, there is no immediate area of difficulty in absorbing increased Japanese investment.

Greater Australian ownership and control of the minerals industry is a desirable, and generally accepted, long-term objective. In the short term, however, efficient growth of the minerals sector continues to require the expertise and ability to mobilize funds of the large international companies. In order to ensure that Australia reaps the maximum benefit from minerals exploitation in these circumstances, it

is important that adequate taxation provisions be implemented and that some restrictions on foreign control be exercised in a way which minimizes the possibility of transfer pricing problems arising. The 51-percent Australian equity provision will not necessarily contribute greatly to the resolution of these problems. However, if administered selectively and with substantial flexibility, it can help to speed the process of transfer to Australian ownership and to avoid transfer pricing difficulties without restricting the rate of growth of minerals production.

6. Long-Term Contracts and Security and Stability in the Minerals Trade

As indicated earlier, the essential security for a large part of Australia's mineral developments was provided by long-term contracts to supply the Japanese market. The advantages of these contracts were that export quantities were guaranteed, within reasonable margins for a relatively long period and that a fixed price was specified which was expected to ensure the profitability of resource developments. At the same time, Japanese purchasers were guaranteed long-term access to large supplies of essential raw materials at prices which would allow them to maintain a competitive position in metals production. During the 1970s, however, the adequacy of contractual guarantees for Australian exporters has been called into question by the effects of exchange rate changes, higher rates of inflation and, more recently, by the failure of Japanese purchasers to meet contractual commitments during the recession. On the Japanese side, concern has been expressed at the tendency of some suppliers to divert sales to spot markets in periods of strong demand, although this has not been a major problem in trade with Australia.³⁷ The principal concern expressed over stability of supply from Australia has been that the high level of industrial disputes in some mining areas threatens the capacity of suppliers to meet contract tonnages and has the effect of disrupting shipping arrangements.

It is important to recognize that mineral export supply contracts

are not interpreted as formal and binding documents, either by purchasers or suppliers. Rather, the existence of a contract gives each side a commitment to trade with the other, and the contract terms represent a basis for continuing discussions as to the manner in which that trade should be conducted. Such flexibility is an important component of the security sought by each party, since neither has an interest in seeing the viability of the other threatened. Thus, in recent years, Australian exporters have been able to negotiate significant price increases outside the formal provisions of contracts. In return, they have accepted, more or less philosophically, the failure of Japanese firms to take deliveries during the recession.

While one side or the other, if not both, would resist any movement towards more formal and binding contract specifications, this does not mean that the nature of those specifications is unimportant. The fact that contract prices were initially fixed in nominal terms and that only limited provisions were made for price adjustments has meant that, as inflation has accelerated, Australian exporters of a number of products have continuously been seeking price concessions from the Japanese purchasers. This "begging-bowl" approach to price discussions has almost certainly placed Australian exporters in a relatively weak position.

In this context, two alternative sorts of changes to contract specifications have been suggested which would result in a more even balance between the parties in pricing discussions. The alternative favored by the Australian Government and by much of the industry is for contracts to provide formally for more frequent, and open-ended, price renegotiation. However, the problem with this approach is that it is unlikely that each side will be able to resist the temptation to exploit fully whatever bargaining strength temporary shifts in world commodity markets confer. The danger is that the generally cooperative long-term framework for the minerals trade may be replaced by a more unstable relationship conducted on a year-by-year basis.³⁸ In that case, the security value of contracts for minerals producers and consumers could be eroded substantially.

The alternative to more frequent formal price renegotiation is to

attempt to build inflation protection and exchange rate cover into the initial contract price. One suggestion has been that the price for half the delivered tonnage be denominated in \$A, with the price for the other half being denominated in Yen, and that each of these prices be linked to an appropriate inflation index for the country in whose currency the price is denominated.³⁹ With such an arrangement real windfall gains or losses to either party from inflation or exchange rate changes will arise only to the extent that differential inflation rates are not offset by exchange rate movements, and then for only half the delivered tonnage.

The essential purpose of this proposal is not to fix prices rigidly over long periods, although they might be less susceptible to change than at present if reasonably accurate expectations as to future market movements were built into the initial contract negotiations. Price discussions outside the formal contract terms would continue to take place as necessary, but the advantage of the dual-currency, index-linked pricing arrangement is that it would provide a neutral frame of reference on which to base those informal price discussions. Ex ante, it would be as likely that each party would be asked to make price concessions as that it would need to seek them.

In addition to the provision of price guarantees, an important function of mineral export contracts is to stabilize quantities traded. However, the quantity specifications really represent a declaration of intent, rather than any firm commitment. Variations from contract tonnage are accepted as inevitable and are only really objected to in circumstances where some discrimination is evident.

In the present recession almost all contracts have been operating at or below the minimum specified tonnages. However, the crucial consideration is whether the effect of the recession on Australia's minerals exports would not have been greater in the absence of the contractual obligations. Certainly, Japanese consumers have carried substantially greater stocks of mineral products than they would normally wish to do. The problem in assessing the extent to which Japanese purchasers have failed to take up contract tonnages is that some producers, who are selling well below contract levels, would not

have been able to deliver larger quantities in any case. Significantly, given the relatively reliable contract performance of Australian producers in the past, the reduction in Japanese uptake of Australian coking coal has been considerably smaller than the reduction in purchases of United States coal. Whereas imports from the US in 1976 were 31 percent below both the 1974 quantity and the 1976 contract tonnage, imports from Australia were 24 percent greater than in 1974 and only about 15 percent below the 1976 contract tonnage.

As noted earlier, the somewhat reduced security value of contracts seems to have led to a greater dependence on Japanese financing in order to bring new projects into operation. Thus, the proposed large iron ore developments in the Pilbara require substantial Japanese loan financing in addition to firm sales contracts and, in most cases, significant equity participation has been offered to the steel mills and trading companies. The offer of equity is principally designed to attract Japanese interest in the project, and to create a situation in which it is possible to obtain loans from the Export-Import Bank of Japan.⁴⁰ It is not clear that Japanese involvement in financing of minerals projects significantly increases the stability of quantities traded.⁴¹ More important seems to be the sheer availability of large amounts of debt funding, on concessional terms, in circumstances where the security offered by contracts is no longer sufficient to allow the level of commercial debt raising required.

By contrast with the above situation, it is possible that, if satisfactory contract agreements cannot be reached with the Japanese steel mills, one or two large new coking coal projects will go ahead without those guarantees. This reflects the favorable expectations as to future coal demand, the high quality of the deposits, and the financial strength of the companies concerned, which makes them less dependent on debt financing (or more able to provide alternative guarantees). However, only the combination of all three factors would be likely to permit development of any new project without the prior conclusion of a firm contract.

Japanese metals producers have used long-term contracts to secure their supply position for a number of years ahead. It is difficult to

assess how adequately future requirements are covered at present, since available data relate only to firmly committed tonnages (see Table 8). A number of iron ore and coal contracts come up for renewal over the next few years, and there is a firm understanding on both sides that renewal will take place. However, in the present recession, the Japanese steel mills have been reluctant to commit themselves to new projects, so that (after allowing for contract renewals) the tonnages contracted for 1980 would be only 70-75 percent of the requirements forecast for that year in 1973.⁴² While this may be adequate for 1980, given present forecasts of steel production, it seems likely that significant additional tonnages will need to be contracted for the period after 1980. With the long lead times in new mine developments, it is possible that the Japanese steel industry may run into a supply shortfall situation in the early 1980s unless contracts are soon concluded for some of the projects presently on offer.

7. Export Pricing and Monopoly Power in Trade

Australia only has substantial monopoly power in the world market for relatively few mineral products. Most notably, Australia produces 91 percent of the world's rutile and 70 percent of the world's zircon. Although, with the assistance of the Commonwealth Government, producers have maintained restrictions on sales and have accumulated stocks of zircon in periods of low demand, this appears to have functioned more as a price stabilization device than as an attempt to force the price onto a higher long-run path. In rutile, where the degree of monopoly power is substantially greater, there have been no restrictions on sales except for environmental reasons. Indeed, the main arena in which Australia's monopoly power in production of these mineral sand products has been stressed has been in consideration of environmental problems. Opponents of sand mining in particular areas have suggested that restriction on supply would improve the terms of trade sufficiently to allow the environmental benefits of those restrictions to be achieved at no cost. However, this consideration

Table 8: Contract Status of Australian and Japanese Trade in Coal and Iron Ore; 1976 - 1986. (Million Tons)

	Actual	Contracted	Forward Contracts				
	1976	1976	1978	1980	1982	1984	1986
<u>IRON ORE</u>							
Australian Exports: Total	78.9	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Japanese Imports:							
from Australia	64.0	70.5	68.0	55.4	42.8	31.4	26.6
from Brazil	25.4	24.4	30.4	44.5	40.0	40.0	40.0
from Other	44.3	54.3	39.4	27.1	21.7	19.7	--
Total	133.7	149.2	137.8	127.0	104.5	91.1	66.6
<u>COKING COAL</u>							
Australian Exports: Total	29.2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Japanese Imports:							
from Australia	26.2	31.9	23.0	19.4	19.4	11.0	5.2
from United States	17.4	25.5	24.5	21.7	20.9	20.7	16.8
from Other	16.1	19.2	9.5	9.4	9.4	9.4	3.1
Total	59.7	76.6	57.0	50.5	49.7	41.1	25.1

Source: Coking Coal Manual, 1976 and Iron Ore Manual, 1976, Tax Report Ltd, Tokyo.

seems not to have weighed heavily in policy decisions.

More important than the exercise of any unilateral monopoly power is the extent to which Australia has, at government level or at company level, cooperated with other producers to influence world prices. There is evidence that Australian uranium companies have participated in an international cartel to control the price of uranium. Similarly, recent information suggests that the international Lead-Zinc Study Group, of which the Australian producers are active members, has manipulated the London Metals Exchange in attempts to maintain high prices. The advantage of this approach is that, since the LME is a small market, it is relatively easy to manipulate the price which then becomes the benchmark for the major contract sales of the producers concerned. While the evidence on the uranium case is unclear, it is certain that the Australian Government (or at least part of the public service) was fully aware of the activities of the Lead-Zinc Study Group. In contrast to the United States' approach, the Australian Government seems generally prepared to allow private companies to combine with overseas producers to exercise monopoly power in international markets, so long as they do not attempt to do so in Australia.⁴³

At government level, attitudes towards producer cartels have been more cautious. With 25 percent of the world production of bauxite, Australia joined the International Bauxite Association but has so far only participated in the exchange of information. Australia's inactivity in the IBA imposes a major constraint on the effectiveness of the producer group. Although the active members enjoy substantial transport cost advantages over Australia in the North American and European bauxite market, transport cost differentials are relatively unimportant for alumina. As the IBA countries seek to gain a higher level of processing to alumina, there is likely to be a substantial incentive for the aluminum majors to seek greater supplies from Australia -- already the largest supplier of alumina to the United States.

However, Australian alumina production is concentrated in the hands of the aluminum majors, and there are problems in assessing the prices at which it is transferred out of Australia. Australia's

information exchange with the IBA countries presumably facilitates the policing of transfer pricing arrangements, and it is possible that, if there is substantial long-run shift of trade towards Australia, the Australian Government may see its interest lying in maintaining the monopoly power of the IBA and this may lead it to play a more active role.

One other area in which Australia has cooperated, informally, with overseas producers has been in the trade in industrial salt. Australia and Mexico each supply around half of Japan's import requirements of this commodity. Historically, the Japanese purchasers had played the fragmented suppliers in the two countries off against one another and had succeeded in maintaining relatively low prices. In recent years, however, both governments have intervened in trade negotiations and have established mutually supportive roles. In 1976, the Australian producers were close to conceding a lower price than the Mexican Government had established. However, at the request of some producers, the Australian Government refused to grant export licenses unless the Mexican price was matched.

Export Price Bargaining in Bilateral Trade

The main focus of policy attention relating to export prices for mineral products has been concerned with bilateral bargaining in the trade with Japan, rather than with world prices generally or with participation in producer groups. The central problem has been to achieve a bargaining situation in which the relatively fragmented Australian producers are not placed at a disadvantage relative to the Japanese purchasing consortia.

Given the short-term rigidities in minerals trade patterns, the short-term bargaining margins in the Australia-Japan minerals trade are very large. However, the interest of the two parties in maintaining access to markets and supplies means that bargaining needs to be conducted with a longer-term view. In the long term, the bargaining margins are principally determined by the transport cost savings associated with bilateral trade.⁴⁴ These are quite substantial, in

relation to f.o.b. values, for a number of unprocessed mineral products.⁴⁵

The recent Australian Labor Government sought to come to terms with the bargaining issue by reasserting the Commonwealth's power to control export licensing. By withholding export licenses until "satisfactory" prices had been agreed upon, the government forced Australian exporters into a more united stance. On one occasion, the Minister responsible attempted to negotiate directly with the Japanese purchaser consortium after the Australian exporters had failed to achieve the required price.

Two important problems are created by government intervention in the bargaining over mineral export prices. The first is the danger that politicians and government agencies will, through incomplete understanding of the basic economic issues, and particularly of the long-term issues, take an excessively optimistic view of the bargaining margins and of their own bargaining strength. In general, it seems likely that avoidance of the risk of over-bargaining will best be achieved when bargaining is conducted between companies with direct interest in the outcome. The second problem lies in the fact that direct government involvement in commercial bargaining can readily shift to, or be interpreted as, a politicization of the conduct of the trade. Since political interests are less stable and less predictable than commercial interests, the appearance of a move towards a politicization of trade issues will generate uncertainty as to the future stability and reliability of bilateral trade for the trade partner.

The nature of the minerals trade is such that, given government monopoly of export permits, Australia holds an enormous short-term bargaining advantage over Japan. An embargo on coal or iron ore exports would damage Australia's economy, but would have a much more disastrous effect on Japan because of the substantial linkage effects that a sweeping cut-back in iron and steel production would have on the whole of Japan's manufacturing industry. In the short term, Japan would have no alternative source of supply for the bulk of the imports normally coming from Australia, and any supplies which could be replaced would probably be at high prices. Japan's vulnerability to a

threat to withhold supplies of basic raw materials means that, at almost any time, an Australian government could force very large short-term increases in the prices obtained for the sale of a number of minerals to Japan. Given the relatively short period over which political success is measured, the danger exists that a government involved in setting the terms for the minerals trade might have a strong temptation to use its short-term bargaining strength to an extent which would prejudice Australia's long-term trading interests. Perhaps more important, the high level of concern in Japan over that country's vulnerability to exercises in resources diplomacy is likely to mean that direct intervention in the minerals trade by the Australian government will, regardless of whether there is any immediate threat to withhold supplies, be perceived in Japan as greatly increasing the risks of remaining heavily dependent on Australian supplies.

The dangers inherent in direct and overt government intervention in the conduct of the minerals trade do not mean that the Australian government has no responsibility to ensure that Australia receives "fair and reasonable" prices for its mineral exports. Rather, what is at issue is the manner in which that responsibility can most appropriately be exercised. The essence of the above argument is that bargaining should be conducted along lines which reflect the basic long-term commercial realities, and that this should be perceived by Japanese purchasers to be the case. Where Australian exporters have no significant bargaining disadvantage relative to Japanese importers, bargaining can most safely be left to the commercial interests. The case for government intervention arises when, as in the coal trade before 1973, united Japanese importers are able to play Australian exporters off against one another and to extract the lion's share of the gains from bilateral trade. In such a situation there is a need to bring exporters together to operate a countervailing cartel-type arrangement.

However, the problems involved in attempting to cartelize Australian exporters, without formal government participation in the operation of the cartel, are fairly substantial. In general, the individual

producers have quite different interests and objectives, so that they are not likely to adhere to any informal arrangement. In this situation, a balance needs to be struck between the dangers inherent in open government action to regulate the bargaining situation and the losses which will arise from incomplete cooperation between producers in trade negotiations.

The present Government has moved back considerably from the degree of intervention practiced by the Labor Government. In the coal trade, for example, producers are required to exchange information and to discuss their bargaining strategy with the appropriate government department. Thereafter, however, they are left to conduct negotiations privately. In this situation it is still possible for the Japanese steel mills to attempt to weaken the bargaining positions of the price leaders by failing to take full deliveries in the period leading up to price negotiations. However, the experience of cooperation and the advantages which it has brought, seems to have generated a move towards increasing unity among the coal exporters, so that their bargaining stance is now considerably stronger than in the past.

Overall, there is no simple formula for ensuring that Australia gains appropriately from the bilateral minerals trade with Japan. Continuous government surveillance is necessary, but this should be concerned more with the market conditions under which price negotiations take place than with any attempt to set prices.

8. Future Direction and Pattern of Australia's Minerals Trade

As can be seen from Table 6, the bulk of Australia's exports of minerals is of unprocessed products and this is particularly true of the trade with Japan. To the extent that metals production has been developed in Australia, this has depended principally on export markets in Europe. The exception is aluminum, where Japan is easily the largest market. However, aluminum is one of the few commodities where Japan depends heavily on imports of refined metal and, in any case, aluminum exports provide an outlet for only a small fraction of Australia's bauxite.

Table 6: Australian and Japanese Trade in Selected Mineral Products

	<u>Australian Exports (1975/76)</u>		<u>Japanese Imports (1976)</u>	
	<u>Value \$USm.</u>	<u>% to Japan (a)</u>	<u>Value \$USm.</u>	<u>% from Australia (a)</u>
Coal	1 290.5	77.4	3 518.1	43.9
Liq. Petroleum Gas	151.3	61.0 ^(e)	880.1	29.7
Iron Ore	972.2	79.2	2 333.8	47.9
Pig Iron	51.1	2.5	53.3	37.1
Crude Iron and Steel	201.4	1.6	15.8	99.9
Nickel Concentrates	13.6	5.0 ^(e)	131.2	-
Nickel Matte	175.9	62.0 ^(e)	135.6	61.8
Nickel (unwrought)	47.0	7.0 ^(e)	54.6	17.5
Manganese Ore	52.3 ^(e)	49.0 ^(e)	118.0	44.4
Tungsten Concentrates	18.5	8.4	20.9	12.0
Bauxite	62.4 ^(e)	45.0 ^(e)	74.2	62.8
Alumina	549.9	13.0 ^(e)	73.5	98.7
Aluminium	55.5	72.8	355.8	10.3
Copper Ore	51.4	96.4	854.2	7.7
Copper (unrefined)	17.0	86.3	52.6	28.1
Copper (refined)	104.3	6.9	287.3	2.9
Zinc Ores	78.4	41.1	210.4	26.0
Zinc and Zinc Alloys	89.3	-	20.9	-
Lead Ores	24.0	9.6	33.7	6.3
Lead and Lead Alloys	139.7	-	22.6	-
Tin Concentrates	17.9	-	(b)	100.0
Tin (unwrought)	15.4	-	231.0	-
Rutile	82.7	4.2	20.2	40.9
Ilmenite	10.6	17.4		
Zircon	65.2	31.5	22.3	96.5
Salt (industrial)	28.5	80.2	90.4	50.8
<u>Total Minerals + Metals</u>	<u>4 366.0</u>	<u>54.2</u>	<u>9 610.5</u>	<u>32.7</u>
<u>All Commodities</u>	<u>12 105.6</u>	<u>32.9</u>	<u>64 842.9</u>	<u>8.3</u>

/cont.

Table 6: continued

- Notes:* (a) % by volume for individual commodities,
% by value for totals.
(b) value close to zero.
(e) estimate.

Sources: Australian Bureau of Statistics, *Overseas Trade Bulletin*,
A.G.P.S., Canberra;
Ministry of Finance, *Japan's Exports and Imports*,
Japan Tariff Association, Tokyo.

\$US values estimated using I.M.F. Conversion Tables
for relevant period averages.

In Australian policy discussion it has generally been considered desirable that minerals should be processed as far as possible before export. On occasion, it has been suggested that Japan "exploits" Australia by purchasing only basic raw materials and preserving the value added in processing for Japanese capital and labor. Clearly, however, it is not necessarily true, as a general proposition, that a higher level of processing would increase the benefit to Australia from the minerals trade. While Australia has an obvious comparative advantage in mining, it does not automatically follow that the additional resources needed in processing will be more efficiently employed there than in other activities.

To some extent, efficient processing in Australia is constrained by problems of scale and by the high cost of internal transport and coastal shipping. Thus, the main areas where processing is feasible are where large processing facilities can be fed by the output of closely located mines. In the case of copper, lead and zinc, for example, a high level of processing has developed around rich mining areas, but the smaller and more geographically-dispersed mines have relied on exports of ores and concentrates.

The main commodities for which expansion of Australian processing seems feasible are nickel, aluminum, and iron and steel. Importantly, Australia has relatively low-cost energy supplies and is better able to absorb the pollutants from minerals processing than more densely populated countries. In the case of nickel, the major Australian producer was able to persuade its Japanese customer to purchase nickel matte instead of nickel concentrates and to close down an inefficient smelter in Japan. However, the Australian refining industry has developed wholly on the basis of sales to Europe. As more nickel deposits are brought into production, the trade is increasingly shifting towards the export of matte and concentrates to nickel refineries and smelters in North America, accompanied by a steady expansion of metal sales to Europe. For aluminum, the main area of processing has been the production of alumina for export to the overseas smelters of the aluminum majors. Australian aluminum metal production is small but has prospects of significant expansion based on

exports to Japan and the newly industrializing countries of the region. The Australian iron and steel industry has significant exports to Asia and the Pacific (excluding Japan), but this accounts for only a tiny fraction of Australia's production of iron ore and coking coal. Any substantial expansion of Australia's iron and steel industry will be likely to depend heavily on exports to Japan.

The future direction and pattern of Australia's minerals trade depends importantly on Japanese reactions to increasing energy and pollution costs. If Japan does move significantly away from a dependence on imports of basic mineral ores and becomes an importer of processed minerals and crude metals, this will have important implications both for the direction of Australia's exports of basic raw materials and for the level of Australian processing. Australian exports of a number of unprocessed minerals products will increasingly be directed to other countries in the region where processing is more efficient than in Japan. At present, Australia has established important links with Korea and Taiwan in the coal and iron ore trade, and these are expected to become steadily more important. At the same time, there will be substantially greater opportunities for Australian production of processed minerals for export to Japan.

In relation to the latter possibility, the established trade links between Australian minerals producers and Japanese processors may provide an important vehicle for rational decision making on the efficient location of processing facilities. Thus, one may envisage the setting up of joint venture processing facilities in Australia, selling to Japan through the distribution networks of the Japanese participants in those ventures. While this will depend crucially on Japanese policy attitudes towards inefficient processing activities,⁴⁶ it will also depend heavily on the extent to which present contractual arrangements are perceived to operate in a stable and cooperative manner and on the nature and stability of Australian policies towards foreign investment.

While it is generally true that Australia's minerals trade will continue to depend heavily on exports of ores and concentrates and processed products to the South East Asian and Western Pacific markets,

for some products the market is likely to become much wider. Australia is already an important supplier of alumina to the United States and this trade is likely to expand. The bulk of exports of liquified natural gas will go to the United States, and any exports of uranium will be widely dispersed. If the real price of coal continues to rise, a number of large new coal deposits may be developed on the basis of sales to Europe, rather than to countries in the Pacific Region. Thus, the prospect seems to be for a greater diversification of markets, both within the Asian-Pacific Region, and between that market and markets in Europe.

Competition for Australian resource suppliers has emerged most importantly in the case of iron ore from Brazil. However, although Brazil has made substantial inroads into the Japanese market, which has had the effect of delaying new mine developments in Australia, it is unlikely that this will continue beyond the point where Brazil and Australia have roughly similar market shares. The more important prospective competition lies in the location of future processing facilities aimed at supplying the Japanese market. Even if Australian and Japanese companies successfully enter into joint venture processing activities, based on the use of Australian resources, there is no guarantee that those facilities will be located in Australia.⁴⁷

9. Concluding Remarks

The range of issues discussed in the paper can be classified into three broad areas of policy interest: balance of payments adjustment and problems of structural change; Federal/State relationships and problems deriving from the division of powers; and policy relating to trade and foreign investment.

Growth in minerals production has created, and will continue to create, pressures on the balance of payments, resolution of which will have adverse effects on other traded goods activities. The contractual nature of much of the minerals trade should allow much of the payments pressure to be anticipated and seen in a long-term context. Thus, it should be possible for exchange rate responses to be more rapid than in

the past, so that inflationary pressures can be minimized. There is an urgent need to examine methods of smoothing the consequent structural adjustment problems and the emphasis should be on promoting change, with appropriate assistance to those affected adversely, rather than on reducing the pressures for change. However, there may be some case for "recycling" a portion of external surpluses resulting from mineral export growth if the pressures for structural change cannot be met or if future income payable overseas is expected to result in a smaller long-term need for adjustment.

The nature of Federal/State relations creates several problems for the management of Australia's resources. In general, there is a need to develop a uniformity of treatment of environmental, infrastructure and taxation issues which requires substantially more co-operation between the Commonwealth and States than presently exists. Of major importance is the need to develop taxation arrangements which do not distort investment decisions in exploration and mining, but which ensure that the rents from exploitation of mineral resources accrue to the community at large. Such taxation arrangements are particularly necessary given the large share of foreign equity in the Australian minerals industry. The major problem in introducing any resource rent tax arrangement is that the States will be reluctant to surrender their rights to tax minerals exploitation. As Table 7 shows, mineral royalties contribute importantly to State revenues, particularly in Western Australia and Queensland.⁴⁸ These States have traditionally been relatively heavily dependent on Commonwealth assistance, and the expansion of minerals production has provided them with a measure of independence and equality with the more densely populated States of N.S.W. and Victoria which has been of substantial political importance. Although the Commonwealth could introduce a resource rent tax without the consent of the States, they would have the power to set royalty rates at levels which ensured that the rent tax earned no revenue -- with severe efficiency effects on the mining industry. Given the general financial powers of the Commonwealth, it is likely that a struggle over resource rents would eventually be won by the

Table 7: Distribution of Mineral Royalties and Shares in State Revenues: Australia 1965/1966 and 1974/75.

	Royalties Received (\$A million)		Royalties in State Tax ¹ Receipts (%)		Royalties in Total ² State Receipts (%)	
	1965/66	1974/75	1965/66	1974/75	1965/66	1974/75
New South Wales	24.3	37.9	8.2	3.1	3.2	1.3
Victoria	0.5	26.7	0.2	2.9	(a)	1.2
Queensland	1.2	34.9	1.3	8.9	0.4	2.8
South Australia	1.0	2.0	1.9	0.7	0.5	0.2
Western Australia	0.5	39.4	1.1	14.4	0.2	4.7
Tasmania	(a)	0.5	(a)	0.6	(a)	0.1
Total States Commonwealth	27.5 (a)	141.4 12.3	3.9 --	4.4 --	1.3 --	1.7 --

Notes: ¹ Royalties as a proportion of all revenues raised directly by States, excluding income from public utilities.

² Royalties as a proportion of total State receipts from all sources, including grants from the Commonwealth.

³ Includes the Northern Territory and Australian Capital Territory, and Commonwealth royalties from offshore oil and gas production.

(a) Value less than 0.1.

Source: Australian Bureau of Statistics, Public Authority Finance: State and Local Authorities, 1974/75, A.G.P.S., Canberra, 1976.

Commonwealth, but the disruption could be substantial and the States might well be able to muster sufficient electoral support to redress the situation.

The major issues in relation to foreign investment and trade lie in setting appropriate taxation arrangements for company profits and in ensuring that commodities are exported at "fair and reasonable" prices. In only a few products are there problems in policing transfers within multinational companies, and it is probably sensible to attempt to administer policy on foreign ownership so that control of minerals production does not lie in the hands of the purchasers of the output. The policy role in determination of prices for arms-length transactions principally should be to ensure that Australian exporters do not operate in a market framework which places them at a bargaining disadvantage relative to overseas purchasers. Given the consortium purchasing policies of many Japanese consumers, there is a need to bring Australian exporters into a relatively united bargaining stance. However, it is important that this should be done consistently and quietly, and that it should not have the effect (or be perceived to have the effect) of shifting trade bargaining away from the essential commercial framework. The paper has stressed the need for stable, long-term relationships to be established in the minerals trade. Rhetoric and direct government intervention in the conduct of the trade are likely to generate uncertainties which are not consistent with long-term development objectives.

FOOTNOTES

¹In fact, Australian oil production was marginal or sub-economic at the import parity price ruling in the late 1960s. In order to allow developments to proceed on an assured basis, they were given guaranteed domestic prices. Since 1973, the producers have come to regret the administered pricing policy, as domestic prices have fallen well below world prices.

²The most striking examples have been in the world aluminum and nickel industries and in the US iron and steel industry.

³A detailed discussion of ownership structures and the manner in which they came about, for the most important minerals developments, can be found in McKern (1976), pp. 206-225.

⁴The one exception is the relatively small Savage River iron ore operation, in which two Japanese trading companies hold 50 percent of the equity.

⁵This general contract form has applied, with variations, in the trade in iron ore, coking coal, and bauxite. In other contracts, for example nickel and copper ores, price was directly related to a "world" price (INCO and LME, respectively). For an analysis of long-term contracts and a discussion of the terms and conditions of contracts for different commodities see Smith (1976).

⁶Sixteen percent per annum compared to 5.5 percent, in real terms (Industries Assistance Commission, 1977, p. 5).

⁷A similar proportion of the workforce is employed in basic minerals processing, but the bulk of these people are employed in the long established iron and steel industry.

⁸Foreign equity accounts for around half the total ownership of the Australian mining industry. According to evidence submitted to the Industries Assistance Commission (1976a), about 70 percent of total capital needs between 1964/65 and 1973/74 was met by borrowing, with overseas borrowing accounting for 40 percent of the total.

⁹The sharp fall in foreign investment inflow had a number of causes including the ending of the minerals development boom as new projects became operational, the revaluation of December 1972, and the election of a Labor government with stricter policies towards foreign investment generally and towards the mineral industry in particular.

¹⁰Garnaut (1977), p. 8.

¹¹ However, there may be significant differences in the rate at which these pressures occur. Also, and more important, the generation of a relatively high rate of inflation involves wider costs for society, and perhaps greater uncertainties for traded goods production, than the alternative exchange rate adjustment.

¹² Gregory's main purpose, in fact, seems to have been to demonstrate that the 25 percent tariff cut represented a fairly small relative price shift compared to the total impact of mineral export growth.

¹³ See, for example, Dixon (1977).

¹⁴ If Australia were a "small" producer in a perfectly foreseeing competitive world market, the value of Australia's minerals deposits could be expected to rise over time at the rate of interest. In that case, postponing mining developments would have zero cost.

¹⁵ Except that, whereas increased tariff protection merely transfers part of the burden of adjustment from the import-competing manufacturing sector to the export sector and, importantly, worsens the position of rural exporters, mineral export restraint reduces the adjustment burden for the manufacturing and rural sectors more or less evenly.

¹⁶ Dixon, et al (1977). Assuming, among other things, a moderate real growth in mineral exports over the next ten years, the model predicts that a number of important manufacturing industries, including motor vehicles, will grow at less than half the average growth rate for the economy, or will actually decline, over the next decade in the absence of increased measures to assist them. However, the projections do not suggest any substantial general need to transfer resources out of manufacturing but, rather, a need to restructure the manufacturing sector itself.

¹⁷ Industries Assistance Commission (1977a, 1977b, 1977c).

¹⁸ For example, the lease on the Weipa bauxite deposit extends for 84 years.

¹⁹ In some cases, these concessions apply only where the processing is conducted within the State concerned and shipments to other states are treated as exports.

²⁰ See the discussion at the end of this section.

²¹ Industries Assistance Commission (1976a). The Australian Mining Industry Council (1971) estimated that, for eleven projects completed between 1959 and 1969, infrastructure expenditure accounted for nearly two-thirds of total capital expenditure.

²²On the one hand, an average charge would deter marginal users who, in the absence of congestion, should be allowed free access. On the other hand, it is generally impossible to tailor charges to the benefits accruing to different users.

²³The Western Australian State Government has, in fact, recently offered guarantees on part of the debt finance for a new nickel development.

²⁴Large long-term loans have been raised, principally from United States' banks, through various financing vehicles. The credit standing of many of the companies involved, or their overseas parents, has meant that no significant premiums have had to be paid for these loans.

²⁵See the following section.

²⁶To the extent that Australian government assistance with financing made it easier to bring projects into operation, it would, of course, reduce the risk of supply shortfalls for Japanese purchasers, so that part of the subsidy implied would be to those purchasers rather than to the Australian companies.

²⁷It also has the possible advantage that the true level of Government subsidy to the uneconomic rail services in areas where there is no mining traffic is concealed by incorporating mining "royalties" in the accounts of the State Railways.

²⁸Although the coal export tax is still applied, the rate of tax has been reduced somewhat and it is expected to be phased out gradually over a number of years.

²⁹Apart from administrative convenience and uniformity of the basis of assessment, this would have the advantage that the tax would rank as a tax credit for the purpose of double-tax arrangements. Charges levied by the States are only deductible, rather than creditable, against overseas tax liabilities.

³⁰Whether or not the arrangement was an "interim" one is open to dispute. One of the companies concerned is presently seeking substantial compensation on the grounds that it undertook large development expenditures on the understanding that blanket approval had been given.

³¹Fraser Island Environmental Enquiry (1976).

³²Fitzgerald (1974) and McKern (1976). Swan (1976) has estimated the cost of the accelerated depreciation allowances alone at \$A 25 million for 1974.

³³McKern (1976), p. 169.

³⁴The share of foreign ownership is found by apportioning value added in each company according to the equity shares in that company. The share of foreign control is found by apportioning all of the value added in a company to overseas interests if (a) foreign companies own more than 50 percent of the total equity, or (b) a single foreign company owns more than 25 percent of the total equity. Australian Bureau of Statistics (1968, 1976).

³⁵This represented the major feature of Fitzgerald's (1974) critique of the contribution of the mineral industry to Australian welfare.

³⁶The requirement is for 75 percent Australian equity in the case of uranium developments.

³⁷The major area of difficulty has been with the United States' coal exporters, who diverted large contractual tonnages to high-priced spot sales (to Japan frequently) during the commodity boom. With one exception, the Australian suppliers were notably more reliable. For a Japanese perspective on Australian-Japanese bilateral minerals trade arrangements, see the paper by Kojima in these Proceedings.

³⁸In the past, Japanese purchasers have insisted on including clauses allowing them to terminate contracts on 12 months notice, wherever annual price renegotiation was provided for. Most Australian exporters wish to avoid such termination clauses in their contracts.

³⁹Arndt (1974), Smith (1976, 1977). The operation of cost escalation clauses in some coal contracts has, to the extent that they have been effective, had some of the effects that this proposal would imply.

⁴⁰In general, the Export-Import Bank is only permitted to lend directly to Japanese companies.

⁴¹For the most part, the financing links have come through trading companies. Where all of the trade is handled by trading companies, each has an interest in persuading the purchaser to maintain shipments from projects with which it is associated, whether or not there is any financing link.

⁴²Japan Economic Research Center (1975).

⁴³In fact, of course, sales in Australia have also been held at high prices, in order to prevent Australian buyers from engaging in arbitrage. However, domestic sales are relatively minor compared to export sales.

⁴⁴For a survey of the determinants of the bargaining margins, and analysis of the bargain outcome under alternative conditions, see Smith (1977).

⁴⁵For example, in 1973 freight costs between Australia and Japan for iron ore were about \$US 4.00 per ton, compared with \$US 6.00 per

ton between Brazil and Japan and \$US 7.00 per ton between Australia and Europe. The average f.o.b. price for Australian exports to Japan was \$US 9.17 in 1973, while the average f.o.b. price for sales to Europe was \$US 6.45, though it is likely that the average quality of Japanese shipments was somewhat higher than that of European shipments.

⁴⁶In a number of instances Japanese minerals processors enjoy substantial effective protection, particularly when world metals prices fall sharply and variable tariffs are used to maintain the Japanese producer price.

⁴⁷The main example of such a venture to date has been the Bluff aluminum smelter, which is located in New Zealand.

⁴⁸In assessing the contribution of royalties to State revenues in Queensland, one should bear in mind also the hidden contribution through rail freight charges.

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AUSTRALIA'S MINERALS PRODUCTION AND TRADE: CASE STUDY OF A
RESOURCE-RICH DEVELOPED COUNTRY
A COMMENT

H. Edward English

The paper by Ben Smith provides much support for the point made by Kojima, namely that, with all its problems, "a country that has is better than one that hasn't." Like Canada, Australia has enough resource wealth that it can be wasteful. Sometimes it seems that Australia, even more than Canada, is testing the limits of wastefulness to the point of finding a new solution to Garnaut's problem of distributing rents.

Smith's paper deals mainly with policy issues, under three headings: the short-term macro-effects of foreign investment; the problem of jurisdiction in the federal state, and the implications of foreign control. The last part of the paper deals primarily with more specific arrangements -- the long-term bilateral contract, and the joint selling approach.

One can quite quickly dispose of the macroeconomic argument, with which I have little quarrel. He makes it clear that the Australian government chose the wrong exchange policy in 1971 (by devaluing instead of revaluing) and that its subsequent moves constituted too slow a reversal. Monetary expansion was the main compensator and of course laid the basis for inflationary conditions. The substantial tariff cuts which were also used came too late in the boom, at least for Smith with the advantage of hindsight.

I do not fully agree with Smith when he says that it makes little difference whether mineral-sector growth is reflected in an appreciating Australian dollar or a relatively high level of inflation. The immediate effect may be the same for other traded goods, but the expectation effects of inflation are likely to be more damaging. In the Canadian case, a commercial policy or lasting exchange-rate change

would generate a rationalization of manufacturing whereas inflation would be more discouraging to any investment. It would depend on how long the appreciation was expected to last. If the inflation was expected to last it would, I think, have much more serious implications for labor-market conditions.

I agree very strongly with Smith's criticism of the Gregory thesis. The income effects of a resource boom have had major positive consequences for the rest of the Canadian economy (notably in the 1950's) and would have more if, at the same time, rationalization of secondary manufacturing had been systematically achieved under well-timed tariff phase-outs and appropriate complementary policy.

The jurisdictional dispute in resource policy is also one familiar to Canadians. The provinces in Canada also control the national resources, and the federal government has to rely on trade and income-tax policy. It has not been common, or perhaps one should say explicit, for the states to require processing in the state (province). That sounds like a serious breach in economic nationhood.

I agree with Smith that the infrastructure subsidy issue is largely a question of whether a public good aspect is present.

The taxation of economic rents in Canada is also a subject of great recent interest. Australia's state governments have apparently adopted a deterrent form of royalty, but are moving deviously to a rent royalty in the petroleum sector. Smith rightly points out that the fear of windfall-like profits to the oil companies should be no greater than that already enjoyed in other mineral sectors; but of course he knows that there is at least one major political difference, even setting aside the special place that oil companies have in the hearts and minds of the electorate. A substantial, government-authorized, sudden upward shift is politically impossible and probably undesirable.

In this matter and in company taxation more generally, it is important that there be a clear view of the comparative national tax position. In Canada generous depletion allowances gained respectability largely because the same sort of thing was done in the U.S. and we

were most anxious that Canadian minerals not suffer from underinvestment. The U.S., Canada, and Australia have all been withdrawing from historic taxation attitudes during the same period, though not at the same pace.

Finally to foreign investment itself. According to Smith the main problems of foreign investment in resource industries are of three sorts -- the loss of foreign control, the loss of rents (and other "excess profits"), and the related avoidance of taxation. I can understand as well as any other nonexpert in public finance the difficulty of designing a resource rent tax. I don't share Smith's concern about transfer pricing. In a society with an advanced bureaucracy, I do not see why most if not all transfer pricing practices cannot be whittled away by a tough tax administration. That is the kind of problem which a good bureaucracy seems ideally suited to resolve. Further, I think they do solve them. The transfer pricing problem is primarily a problem for less-developed countries, for two reasons: the incentive to use transfer pricing is much greater where tax systems vary so substantially (in many cases) between host and parent nations; and the bureaucracy is thinner, and more easily intimidated by politicians in cahoots with multinationals. Is Smith's concern over transfer pricing a commentary on the Australian governmental system?

More particularly I do not think the technical services fees and royalties are that difficult to police. In Canada I have not yet heard of a confirmed case where the subsidiary was found to be paying more than the economic value of such resources.

On the specific trading arrangements, Australia's experience again is like Canada's. Actually the long-term contract came relatively recently to Canada in the form of copper and coal deals with Japan. In copper, the Japanese typically provide capital, Canada or U.S. the management, and the Japanese get a long-term commitment to supply at approximately LME prices. In the coal case, the arrangement involves less finance and an unhappily more rigid price commitment. I have the impression that the Canadians' deals were treated as more

binding than the Australians. It is a little difficult to evaluate the significance of the particular pricing practices under the Australian arrangements. Smith at one point makes it appear that Australia has the upper hand while at another he writes about the begging bowl. I presume that the main problem was the unusually violent fluctuation of market conditions in recent years. I am intrigued by his methods of hedging exchange rates and inflation in these arrangements.

Let me deal very briefly with the international trade and investment arrangements. I am somewhat encouraged by Smith's paper that Australia and the rest of us can all learn something from the experience of recent years, but the main lesson is that it is preferable to make arrangements to avoid short-term bilateral deals in favor of long-term and preferably more multilateral ones. The Pacific region has some potential as a multilateral group in these matters of mineral resources trade and investment.

AUSTRALIA'S MINERALS PRODUCTION AND TRADE: CASE STUDY OF A
RESOURCE-RICH DEVELOPED COUNTRY
A COMMENT

Hang-Sheng Cheng

In his paper, Ben Smith has presented a panoramic view of the issues arising from Australia's role as a major mineral producer and exporter. Altogether, ten issues have been discussed, and on each he has something interesting, informative, and provocative to say. Rather than covering all the ten issues, I have decided to comment on only a few of them.

The first topic is the balance-of-payments impact of the rapid growth of Australia's mineral industry on the rest of the economy. Among the issues raised in the paper, this is to me not only the most interesting but also the most controversial. It is referred to in the paper as the "Gregory thesis," in reference to a 1976 article by R. Gregory. Simply stated, it is as follows. Since 1960, Australia's mineral production and exports have grown very rapidly. In addition, the growing mineral industry has attracted large capital inflows. The combination of export growth and capital inflow is said to exert an upward pressure on the exchange value of the Australian dollar. According to this argument, the Australian authorities face a difficult policy choice: if they let the Australian dollar appreciate, it would adversely affect the trade competitiveness of all the other Australian products and thus bring about recession and unemployment; if they intervened to prevent appreciation, it would result in a rapid rate of reserve increase, monetary expansion, and domestic inflation. The policy recommendation is either to restrict mineral-export growth and capital inflow or to encourage capital outflow.

Now, that is a curious argument. It is just the opposite of the "export-led growth" thesis familiar in development economics literature. Instead of export expansion leading to a vigorous domestic

economic growth, the "Gregory thesis" asserts that expansion in the mineral industry, through the balance-of-payments impact, would result in domestic recession and unemployment. What is so special and detrimental about mineral-industry expansion? Smith mentions two factors: (1) high capital intensity in the mineral industry, and (2) sluggish adjustment in shifting resources from other sectors to the mining industry.

Smith states very clearly that he is against restraining mineral-industry growth. He favors adjustment assistance. I do not disagree with him on the policy stance. But, my interest is focused on the theoretical and empirical validity of the "Gregory thesis." Because if the thesis is valid, not only Australia, but all mineral-producing and exporting countries should re-examine their policy toward the mineral industry.

It might appear that the thesis could find support in both balance-of-payments theory and international-trade theory. Let us examine the two in turn.

The balance-of-payments argument has already been stated: mineral-export growth plus capital inflow tends to put an upward pressure on the exchange value of the national currency, and hence a depressive effect on the aggregate demand for the nation's products. The reasoning is strongly reminiscent of the argument the former Governor Coyne of the Bank of Canada used against capital inflow in the late 1950's when Canada had flexible exchange rates. Governor Coyne blamed Canada's high unemployment and slow economic growth on capital inflows, which resulted in appreciation of the Canadian dollar, current-account deficits, and deterioration in Canada's competitiveness in world trade.

Governor Coyne's argument has since become a favorite classroom example for teaching balance-of-payments theory. Capital inflow is not the cause of current-account deficit, but merely the other side of the same coin. A current-account deficit does not mean a reduction in aggregate demand; it merely reflects the country's demand for foreign capital. In Canada's case, both the large capital inflow and the high unemployment in the late 1950's were a result of the tight monetary

policy pursued by the Bank of Canada. In Australia's case, a high rate of return on capital plus short-run exchange-rate speculations can perhaps explain much of capital inflows in recent decades.

In Australia's case, in view of the high degree of protectionism against imports, it would be particularly difficult to justify the argument that export growth and capital inflows tend to exert upward pressure on the exchange value of the national currency. Even if there were such pressure, it could be relieved by reducing trade barriers and thereby achieving more efficient domestic resource allocation. Moreover, in a growing economy, with the rising import demand, the upward pressure on the exchange rate should not arise at all.

Data on Australia's balance-of-payments lend support to this analysis. Smith tells us that Australia's mineral-export growth was very rapid from 1960 to 1971 and slowed down sharply thereafter. During the 1960-71 period, Australia had a fixed exchange rate for its currency. The rapid mineral-export growth paralleled rapid expansions in import demand, such that there was a growing current account deficit financed by capital inflows. Official foreign reserves increased only moderately. There is no evidence that mineral-export growth and capital inflow had resulted in any upward pressure on the exchange value of the Australian dollar.

The "Gregory thesis" emphasizes the capital intensity of the mineral industry and the difficulty of absorbing the labor released from other industries. The argument recalls the Stolper-Samuelson Theorem in international trade theory, which states that the opening of international trade in a two-product, two-factor economy leading to the export of the capital-intensive product will necessarily reduce the real wage rate of labor. Now, if in addition we assume that labor through union power resists reduction in real wage rates, the outcome will be a rise in unemployment.

My comments in this regard are twofold. First, the Stolper-Samuelson Theorem is a general-equilibrium analysis with given amounts of labor and capital. It is not applicable to a case in which there is continuous injection of foreign capital into the country. The capital

inflow could enable labor to have a higher productivity, more than offsetting the reduction in labor productivity resulting from the substitution of labor for capital as a result of trade. Secondly, as we turn to empirical data, we find that the period of rapid growth of Australia's mineral industry (1960-1971) coincided with the period of rapid growth in manufacturing employment (by 25 percent); and that after mineral-industry growth slowed down since 1971, manufacturing employment has remained essentially flat and even declined in recent years. Thus, there is no evidence that mineral-industry growth had caused unemployment in the manufacturing sector.

The outcome of this analysis is that there appears to be no justification for restraining mineral-industry growth on balance-of-payments considerations. Let us turn the table around and ask whether there are grounds for using fiscal devices for encouraging mineral-industry growth. This brings me to the second topic I would like to discuss: namely, subsidies and tax incentives for the mining industries. Smith has some very interesting discussion on this issue. He shows that prior to 1973, Australia accorded very favorable tax treatment of mining companies in the form of immediate or accelerated depreciation allowance and exemption of one-fifth of the profit earned from the production of certain mining products. For a five-year period prior to 1973, the tax reduction amounted to some \$A700 million compared to \$A260 million tax paid.

This kind of tax incentive not only applied in Australia, but is very common in many developing countries. The presumption is that because of the high risk involved it is necessary to offer these incentives for attracting investment in the mining industries. Many developing nations apply the same justification for offering substantial tax benefits for attracting foreign investment in their local industries. I am sure that foreign investors love it and would not hesitate to play one developing country against another in competition for their investment. The result has been distortion in resource allocation and loss of revenue for the host countries. I am glad to know that Australia abolished all such incentives in 1973, and in 1976,

following an Industries Assistance Commission report, adopted the principle of tax neutrality among the various sectors of the economy. I suspect that the Commission report might qualify as required reading for tax authorities in both developed and developing countries.

I would like to make a few points concerning some of the foreign trade and foreign investments issues raised in Smith's paper. First, the Australian requirement of majority Australian equity in all new mining projects has aroused a great deal of controversy. Although one can appreciate the "satisfaction of nationalistic sentiment," the crucial question is whether the policy is in Australia's long-run interest. Smith attempts to draw a distinction between "Australian ownership" and "Australian control" of resource exploitation. I am rather dubious that foreign investors would go along with that distinction: to have control without ownership or have ownership without control. In this regard, I call your attention to Smith's statement that "there are really only three Australian companies with the experience and financial resources necessary to take up this role (of control)." If that is true of Australia, how much more true it must be of the developing nations in the Pacific Basin region!

My last comment has to do with foreign trade policy on mining. Australia exports mostly unprocessed mineral products and does not attempt to encourage processing within Australia. I fully endorse Smith's suggestion that it is a matter of comparative advantage in terms of economies of scale and cost of overland or coastal transport. In this regard, I find particularly intriguing Smith's speculation on the future pattern of Pacific Basin mineral resource trade. In terms of location economics, it may well be most beneficial for all parties concerned to have Australia export unprocessed mineral products, Indonesia, the Philippines, Taiwan, or Korea do the processing, and Japan to use the finished products in higher manufactures. However, many existing trade barriers would need to be removed before that kind of trade pattern could emerge.

AUSTRALIA'S MINERALS PRODUCTION AND TRADE: CASE STUDY OF A
RESOURCE-RICH DEVELOPED COUNTRY
GENERAL DISCUSSION

1. Speed of Exploitation

There are conflicting views concerning the proper speed of resource exploitation: some argue that it is "better to take the money now" because in the long run, the terms of trade will decline, while others argue that a number of other considerations may make slower development economically and socially more desirable.

Foregoing mineral exploitation is different from foregoing other types of economic opportunities: In manufacturing, for example, since the mineral will remain in place, waiting may be better, especially if other countries' tax and other policies are such that immediate exploitation means losing rents that may accrue under different conditions. The mining country also needs to consider alternative investments. While Smith feels some slowdown is possible, he pointed out that some opportunities can in fact be irretrievably lost in that one must deal with buyers when they want to buy, which also puts the seller in a somewhat better bargaining position. It is not clear that future scarcity will cause such high future prices that anything is gained by waiting for them.

2. Balance of Payments

Australia's current account surplus -- specifically its bilateral components with developing Asian countries -- raised the issue of why Australia was not more willing to buy goods from its minerals customers. It would also be in the interest of Australia's consumers.

Adjusting to slower growth or even declines in output means resource reallocation, and the private costs may be less than the

social ones. Rather than slow export growth, Smith feels it better over the long run to buy from the more efficient foreign producer while providing transitional aid to those leaving the dying domestic industry in a systematic way rather than on an ad hoc basis.

It was observed that inflation is not an efficient way to compensate for structural changes in most cases. However, exchange rate variations are not very desirable either, especially when balance of payments difficulties are cyclic rather than secular. Tariffs might be adjusted in such cases.

As an overview, it was suggested that Australia should recognize that it is now, or might consider becoming, a rentier country. Given the huge resource base relative to the present population, immigration restrictions, and the lackadaisical work ethic, it might be best to use current mineral earnings to acquire foreign assets. The current situation may reflect a capital-market problem rather than be an indicator of structural imbalance and a move in this direction is already underway.

OPTIONS FOR A RESOURCE-POOR DEVELOPED COUNTRY -- JAPAN

Yasuhiro Murota*

1. Introduction

Japan is poor in natural resources, especially relative to its large population. Weinstein has outlined three options for Japan given this situation:

1. buy resources;
2. directly control resources (often through military power);
3. do not obtain resources and enter economic depression and decline.

Weinstein is a political scientist writing about the 1930s and his categories are perhaps a little rough from an economist's point of view. However, to me they seem appropriate because Japan has actual historical experience with the first two and some concern that the third will also happen. Moreover, resources involve political issues and time horizons longer than those in usual economic analysis. Section 2 discusses prewar Japanese development (when option 2 was tried) while section 3 covers the postwar (option 1) period. Special attention is given to iron and steel, copper, lead, zinc and aluminum in the text and in tables at the end of the paper.¹

Weinstein sets out the third option negatively, but in section 4 I recast it as a positive evolution from a wasteful to a frugal society and briefly explain why I consider it both feasible and preferable for

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the future of Japan.

For at least the last 300 years, Japan has had a few broad national goals which have had profound impact on the patterns of life. Initiated as policies to deal with specific issues at the time, they evolved into abstract concepts with lives of their own. As such, they have continued with little consideration of other possibilities even after their original purpose has been achieved, until some external shock strengthens the internal forces working to discard them.

Thus, from the mid-17th to mid-19th centuries Japan sought to live largely separated from the rest of the world. The threat of western imperialism helped shake the country out of its isolation and a new desire emerged -- catching up with the advanced western countries. Before World War II this meant both economic and military strength. Victory in the Russo-Japanese War (1905) suggests the latter had by then been achieved. But the military continued to be important and, while there was considerable deemphasis of its role and status during the 1920s, the shock of the depression helped push Japan back into the active, ultimately overriding pursuit of military strength. Only defeat in the 1940s eliminated the goal. Since the war, economic growth alone has been the target.

It should be remembered that Japan sought military strength initially as a defense against western imperialism, and then itself became imperialistic. Variations of option 2 were the international norm before World War II. In the peaceful 1920s Japan also cut back its military establishment and overt use of option 2 methods. Option 1 has been the postwar norm and, in entrusting itself to the functioning of the market mechanism, Japan has been one of the chief beneficiaries of an international environment which has made the option viable. Postwar growth was so impressive for so long that sight is sometimes lost of its exceptional nature (table 1; major indexes of the economy are given in tables A1 and A2 at the end of the paper).

2. Prewar Development and Recovery

In 1868, with the Meiji Restoration, Japan began to establish a modern nation. The new government adopted policies calculated to enrich and strengthen the country through expansion of military forces and promotion of industrial development, so as to avoid subjugation by the western imperialist powers. Among the steps taken were the establishment of army and navy arsenals in 1877, construction of government-operated plants, and promotion of railway and marine transportation.

Great success resulted, and Japan soon followed the western model further. War with China (1894-95) gave Japan Formosa and large reparations, which made possible the transition to the gold standard and construction of iron foundaries. Confrontation with Russia led to the Russo-Japanese War (1904-5). Japan, again victorious, gained dominant power in Korea and Kwantung, as well as control of the South Manchurian Railway. Establishment of the Manchurian Railway Co. in 1906 helped develop the area's mineral resources for Japan. As an example, the railway constructed the Anshan Iron Foundry in 1918. Korea and Formosa, like Japan, have few minerals, but they became important sources of foodstuffs -- particularly rice and sugar.

In Japan proper, apart from gold and silver, the only extensive mining was for copper. In the late 19th century Japan was one of the world's principal copper producers and the metal was an important export (table A7). The industry was able to increase production despite pollution problems and an 1884 riot in Ashio over working conditions.

The government-owned Yahata Steel Foundry began production in 1901, and full-scale operations were achieved in 1905. Outside of iron and steel, government policy was to encourage private ownership, and in the 1880s many copper mines were sold off. While some foreign engineers were used, primarily by the government in the 19th century, no foreign ownership occurred.

The First World War proved to be advantageous for Japan as the most-industrialized country in Asia. When trade with Europe was

curtailed, Japanese exports and domestic import substitution expanded. Growth of machinery, chemicals, and metals (including lead and zinc smelting as essentially new industries) was especially striking. However, in the 1920s, in part because European goods were available again, the economy suffered from repeated recessions (in 1920, '23, and '27) and industrial activity remained at a low ebb.

During the 1910s and 20s domestic pig iron was only marginally competitive, and the large, fully-integrated firms such as Yahata faced severe competition from an increasing number of mills making steel from imported scrap and pig iron. In the 1920s Japanese copper ceased to be competitive as technological innovations such as the flotation and reverberatory processes enabled large-scale refining by American companies of low grade North American ores. By the end of the decade many small smelters had been liquidated and the remaining industry was dominated by five firms, three of which were affiliated with major zaibatsu.

Between 1912 and 1928, Japanese exports grew at 6.2 percent a year. Japan's share of world trade increased from 1.8 percent in 1913 to 3.1 percent in 1925.

The depression saw the world divide into blocs. In 1931 the United Kingdom left the gold standard and in 1932 tried to organize a sterling bloc at the Ottawa Conference. The United States abandoned gold in 1933, placing emphasis on rebuilding its domestic economy largely in isolation from the rest of the world. Germany formed an exchange control zone with Eastern Europe. The international gold standard collapsed, hindering trade and transfer of capital.

Korekiyo Takahashi became Japan's finance minister in 1931 and immediately took the country off gold. He tried to reflate the economy through government deficit spending, with stress on rural construction. A devaluation policy caused the yen to fall 43 percent against the dollar between 1930 and 1932. This helped expand exports and thus brought protests from other countries. In 1936, Japan accounted for 3.6 percent of world trade.

Weapon procurement -- particularly naval vessels -- aided heavy industry, as did penetration of Asian markets for machinery and steel.

World crude steel output was halved between 1929 and 1931, but Japanese production fell by less than one-fifth. Nippon Seititsu was formed in 1934 from government and private steel firms in an attempt to rationalize production for increased productivity, and thus also export competitiveness.

Yen devaluation helped restore the domestic copper industry, as did munitions orders. For strategic reasons full-scale development of lead and zinc mining began in the late 1930s. Led by demand for aircraft, aluminum emerged as an important new industry, with several companies established to produce it using the Bayer process and Indonesian bauxite.

Japan sought to form a bloc and, with the 1931 Manchurian incident, tightened control of Northeast Asia and its resources. But the region lacked oil, bauxite and other minerals needed for a self-sufficient bloc. For example, attempts to exploit Manchurian alum and aluminous shale failed, and in 1939 Japan obtained only 17 percent of iron ore and 1.4 percent of other ore imports from the yen bloc. Copper, lead and zinc imports all were from outside (Gendaishi Shiryo, p. 114). Even at the height of its prewar power Japan was obtaining most of its raw materials through purchases on the world market.

Such dependency was a reason for looking to China and then Southeast Asia as components of what came to be called the Greater East Asian Co-prosperity Sphere. A 1940 semi-official report on the sphere saw Japan at the center with sophisticated industries such as precision machinery. Manchuria was to expand as a mining and processing center, utilizing its coal-based electric power capacity, and develop related heavy industry. China's role was similar to Manchuria's, though with less emphasis on industrialization. Later, when Southeast Asia was brought into the concept, it was for Indonesian coal, oil and bauxite, Thai tin and tungsten, Malaysian rubber, tin and iron, and Philippine copper and iron.

Western colonial powers dominated the Southeast Asian countries Japan looked to for resources. War in Europe again seemed advantageous to Japan's position in Asia, and in 1940 troops were stationed in Vietnam. The west retaliated, with the United States putting scrap

iron and oil exports to Japan on a quota and in 1941 embargoing oil. These actions, and American harassment of Japanese shipping, were considered serious threats to the country's well being and helped drive Japan further down the road to World War II.

After war with China began in 1937, mining and the metals industries came under increasing government control. American attacks on Japanese shipping following Pearl Harbor decreased raw material supplies, and by 1943 metal production was declining.

The Allied Occupation following World War II carried out various institutional reforms including recognition of labor unions, dissolution of zaibatsu, and land reform. These were part of the foundation for subsequent rapid economic growth. In 1947 a priority resource allocation system was set up to increase steel and coal production and eventually put the economy back on the rails to rehabilitation. The Dodge Plan, with its large budget surpluses, was adopted in 1949 to end inflation, but it also significantly slowed the recovery.

Another war injected new vitality into the economy. Hostilities in Korea expanded domestic and foreign markets rapidly. In 1952 Japan regained independence under the San Francisco Treaty.

It took longer for the nonferrous industry to recover. One reason was serious deterioration of the mines. Only high grade ores had been extracted during the war and adequate maintenance of the shafts had not been conducted because of a shortage of materials. In addition, large quantities of copper metal were released from military sources and copper could also be recovered from war scrap. Copper ore output in 1947 was one-third the prewar high. The Korean War swept away the metal inventories. Full-scale rationalization of the industry began in 1952 with mechanization of mines and new technical considerations given to differing smelter treatment of low and high grade ores.

3. Rapid Economic Growth (1955-73)

Loss of the war precluded the second option, and Japan had no desire to stagnate. This meant only option 1 was left, and the world situation has made it feasible, since the postwar era had been one of relatively free trade. Between 1955 and 1973 Japan's annual growth was 9.8 percent, approximately twice that of world GNE. By 1968 Japan had the third largest economy in the world, although in per capita terms several countries still are larger.

Japanese exports also expanded about twice as rapidly as world trade, increasing from 4.0 percent of the total in 1955 to 6.5 percent in 1974 on an export basis. Japan became the third largest exporter (after the United States and West Germany) in 1970.

In the late 1960s, overseas direct investment began to increase as Japan sought to deal with a continuous surplus in its balance of payments, loss of comparative advantage in many light industries, and a desire to secure the large amounts of energy and other resources necessary to maintain the economy. The last has not been a nonmilitaristic return to option 2, as even peaceful control (direct ownership) of mineral sources is only limitedly possible because of nationalism in most resource-rich countries, as discussed by Kojima in his paper.

Outstanding overseas direct investment (table 2) jumped from \$143 million in 1958 to \$12,666 million in 1974, fourth after the United States, United Kingdom and West Germany. Most investment in minerals has been in iron and copper, some 12 percent of the total in 1971. Offshore processing, almost all for iron and steel mills, is less than 5 percent of the cumulative total.

Rapid export and investment growth has caused friction with other countries, with Japan usually agreeing to restrictions. Thus in 1968 Japan voluntarily controlled iron and steel exports to the United States and in 1972 did the same for textiles.

Japanese metal production has expanded three to four times faster than world production. By the late 1960s Japan was the largest

importer of ores, though not of every specific one. This relates to heavy industry growing even faster than the total economy -- as shown in the appendix, GNP elasticities for most metals have been much greater than one. Increased demand has meant ever larger imports, with the few domestic sources becoming less and less important. The declining self-sufficiency levels and sources of ore supply are in tables A6, A9, A12, A15, and A18.

Postwar steel grew up around shipbuilding (see Blumenthal) and construction, although autos are now the second largest user after construction. Exports are currently about 20 percent of direct output, but since many of the cars and ships are exported, the actual production share is much higher. Most of Japan's industrial capacity is on coastal soils requiring piling, and pipe for this purpose is a major product (about 10 percent of total output). In 1974 iron and steel provided 8 percent of GDP on a value-added basis. (See Tables A3-A6)

The industry has undertaken three rationalization programs. The first, begun in 1951, stressed introduction of foreign technology. On advice from the American steel industry, strip mills were built even though Japanese demand for sheet at the time was limited (principal uses are automobiles and other consumer durables). In the last half of the 50s, iron foundries were modernized. The third program, in the early 60s, sought general productivity increases to improve international competitiveness. Several specialty steel makers went bankrupt in the mid-60s.

Large, fully integrated mills with capacities over four million tons and using continuous casting were started in the late 60s, including Fukuyama (at 16 million tons, the largest in the world), Mizushima, Kimitsu and Kajima. In 1970, Yahata and Fuji, the result of the Occupation's breaking up of Nippon Seitetsu, were remerged. Shin Nihon Seitetsu is the largest steel company in the world.

Steel industry programs to deal with pollution accounted for about 20 percent of such investment in 1973.

While distances for imported iron ore have become greater (table A6), innovations in marine transportation have reduced delivery costs from \$5.00 a ton in 1965 to \$3.70 in 1972.

The nonferrous metal industry, increasingly reliant on foreign ore, has moved from domestic mine sites to coastal areas. (see tables A3 and A7-A18). In the early 60s, partly because of strong pressure on Japan to liberalize trade in general, import restrictions began to be relaxed: aluminum starting in 1961, copper in 1963, and lead and zinc in 1964. With the exception of titanium sent to the United States, the nonferrous industry has not been export-oriented, although it has used foreign markets to adjust its inventory levels.

Copper is one area where overseas investment in ore development has occurred -- about one-fourth in Zaire and a sixth each in Canada and Malaysia as of 1975. Imports of the metal have increased as well, from 59 thousand tons in 1960 to 310 thousand in 1973.

Nickel, as a specialty steel and electrical equipment component, has become an important industry. It is now also used in space and ocean exploration.

Government encouragement has helped production of titanium (used in the chemical industry since it resists corrosion), zirconium (also corrosion-resistant, and used in nuclear reactors), beryllium (for reactors), germanium (semiconductors), SCR (high-purity silicon, used in electronics), and tantalum (condensers).

The oil crisis was a hard blow to the Japanese economy since foreign energy dependency (mostly oil) is very great. The overall balance of payments in 1973 was a \$13.4 billion deficit. In 1974 the economy experienced a decline in the GNP for the first time since the war, and in 1975 the increase was only 2.4 percent. The decline was especially marked in plant and equipment investment. Influenced by the worldwide recession, 1975 exports remained at the 1974 level and overseas direct investment plummeted.

As the recession became more severe and prolonged, processed mineral stocks accumulated. Japan exported substantial amounts of electrolytic copper in 1974, bringing cries of protest from CIPEC.

Aluminum smelting, being very energy-intensive, has faced huge cost escalation. This poses the question of its continued viability in Japan in the face of competition from smelters with access to cheap hydroelectric power.

4. The Future

Where does Japan go from here? A semi-official view from MITI (The Ministry of International Trade and Industry) has been published periodically, each looking about ten years ahead, and the Japan Economic Research Center has published two studies in English closely paralleling the MITI ones. The 1975 MITI report notes higher living standards, approaching those in advanced western countries, and that some of the negative consequences of past growth have caused Japanese to question the desirability of continued rapid growth (pp. 3-4). Partly from these considerations, and primarily from concern over resource availability, the report sees a slowing of growth to around 6 percent between 1970 and 1985 (p.87). It recommends increased investment in housing and social overhead items, even at the expense of plant and equipment investment (p. 80).

Labor- and resource-intensive industries in which Japan has no comparative advantage will be deemphasized in favor of knowledge-intensive industries. Thus, textiles, iron and steel, and food will decline in importance while electronic products and industrial machinery will continue to grow. Supply and environmental constraints are the reason why metals growth generally is expected to slow. The report sees steel exports experiencing an absolute decline in the 1980s (p.98) and the weight of all ores in total imports being reduced from its 1974 level of 8.6 percent to 5.5 percent in 1985 (p.105). (Before oil prices increased, causing fuel's share to double, ores' weight had been over 14 percent.) Japan's share of world mineral consumption and domestic demand for metals will nonetheless increase (table A3).

Greater geographical dispersion of plants is also advocated both within Japan and offshore. Overseas investment will grow over 18 percent a year to 1985 (table 3).

Kojima's paper outlines evolution within option 1 during the last 25 years, from Japan being a marginal buyer to one for whom large new mines are developed. MITI's vision is a continuation of this, modified somewhat by greater offshore processing in facilities increasingly Japanese-financed.

Let us consider some aspects of this pattern. The international environment that made option 1 such a success for Japan in the 1950s and 1960s is passing. The world is economically tenser and more unstable. Pluralism and increased interdependence means that when something happens it takes longer and costs more to return to equilibrium. The Nixon Shock in 1971 and the 1973 Oil Shock raise the 1930s specter of bloc economies and trade wars. And also as in the 30s, Japan faces strong resistance to any attempts at full control of resources -- even by peaceful ownership, let alone by military force.

Resource exploitation has become a major issue in North-South relations. Increasingly resource-rich less-developed countries look to their minerals and other raw materials for their own development -- as both the basis for industrialization and a source of foreign exchange to finance it. Japan's ever-rising share of natural resource supplies thus faces a much higher risk of disruption, in terms of both pricing and physical availability. After the Nixon and Oil Shocks, and with Club-of-Rome-type studies circulating, physical limits were taken very seriously, stimulating a good deal of discussion on "The Conditions to Overcome Zero Growth," as one book was titled. The author, Osamu Shimomura, became famous for being one of the very few in the early 50s to predict Japan's subsequent growth. With the possible exception of oil/energy/supplies, and then only as short-run disruptions, I do not expect resources to be completely unavailable, nor do I even see pricing posing insurmountable difficulties. But the possibilities and increased uncertainties mean Japan's economic underpinnings are less stable than they have been.

Japan runs trade deficits with a number of its resource suppliers, particularly the oil producers. To pay for raw materials Japan exports finished goods, running surpluses with quite a few customers. If

bilateral balancing is sought by very many of them, Japan's position becomes very difficult. The impact of Japanese trade on specific countries has been an ongoing issue for some time, but with both the impact and protectionism greater than in the 1950s and 60s, Japan is much less secure.

For a variety of reasons, slowing of Japanese growth is generally acknowledged, but the absolute increments will still be large -- today a 6-percent growth rate yields a larger absolute increase than the 11-percent rate of the mid-60s. Pollution and other negative aspects of past growth will remain serious problems.

Crowding in urban areas, worker alienation and other social woes, while not inherent results of growth, are nonetheless popularly viewed as problems of it. By the early 1970s the desirability of continuing rapid growth policies was openly questioned in books such as Kutabare GNP (Damn GNP, published by the prestigious Asahi newspaper).

Japan is a country in which almost everyone (90 percent in a 1969 government survey (EPA 1970, pp. 5-6)) feels -- and in fact is -- middle class. Indeed, in 1970 the government reported a dissolution of poverty was underway (EPA 1970, pp. 192-93). But with affluence has come a "new poverty" (atarashii hinkon) noted by, among others, Chubachi and Taira (p.434). "Despite their high level of living (seikatsu suijun), the affluent of today's povertyless Japan claim they are worse off than before relative to the standard of life (seikatsu hyojun) their productivity should bring about." Fulfillment, stability, and equilibrium have become the most common answers to public opinion surveys asking questions such as, "What is important as a social target for Japan?" Growth, development, and expansion, which overwhelmingly dominated such polls in the 1960s are now among the least common responses, although affluence has held its ground. Japan is a very materialistic society, but is not entirely comfortable as such.

There are two broad approaches to measuring the happiness of life. In the first, favored by the growth believer, happiness is indicated mainly by the absolute level of consumption (quantity of life). The

growth believer thinks material progress is good and its continuation is desirable. In the second, favored by the nongrowth believer, happiness is measured by the "quality of life." The nongrowth believer thinks composure, calmness and creative work are desirable, while intensified human relations, monotonous work and destruction of nature is undesirable. Japanese have been growth believers for the past century, but the Buddhist and Shinto traditions are more steady state and austere. So, for Japanese, the change from higher to lower growth is not so much to enter a new era but to return to old tastes. Japan seems to be in a transition phase again, internally disillusioned with the concept of rapid growth, and shocked by external events into concern over its feasibility.

Japan is moving toward zero population growth (table 4). I think at the same time it can and should move toward zero economic growth -- 2 to 4 percent for 1985-2000 and 0 to 2 percent in the 21st century. This is not the place for an extended discussion of steady-state economics (see Daly and Landsberg). For Japan, there can be a cutting back of demand for resources, at least relative to world demand, through greater recycling and less waste. Anyone who rides Japanese trains or hikes knows the potential for recovery of glass, paper and metal is significant. Less dependent, Japanese will be more secure, and the resources will be released to other countries for their industrialization.

The EPA estimates that a 20-percent increase in current metal recovery rates will reduce demand 17 percent for the ferrous and 23 percent for the nonferrous metal industries (Nihon Keizai, p. 24). American calculations suggest energy used to recycle steel is 70 percent less than for new steel, with air pollution cut by 85 percent and water pollution by 75 percent (Nihon Keizai).

Unemployment is frequently cited as a problem in low-growth economies. In the worst case, labor demand will decline because of labor-saving technological change, but this depends on relative prices. On the supply side, the working-age population, its participation rate, the number of hours worked, and quality are all factors.

Quality is likely to continue to improve, but the movement toward zero population growth will stabilize the number of potential workers. Lower participation rates (e.g. from people staying in school longer) and shorter working hours (through job sharing) can reduce actual labor supplied without necessarily creating unemployment.

The possibility of less social mobility is also not a problem for a steady-state Japan. Artists and craftsmen have a long tradition of being respected (ranking ahead of merchants during the Tokugawa period). Money, after all, is not the only source (or indicator) of status. A steady-state economy does not mean living standards will be frozen. They have reached a sufficiently high level that slower growth of the material aspects are, I feel, quite tolerable as long as other issues are being addressed.

One of these is worker alienation. To say Japanese are more loyal and committed to their employers than workers elsewhere is not to say they are happy. This problem must be dealt with regardless of which option Japan chooses. I think the simple release of tension from deemphasizing growth will help solve it, and more of the time and talent spent spurring growth can be applied to the problem. In this regard I see the emergence of a more handicraft-oriented production system. By this I mean the worker being more a human being creating something than an appendage of a mass-production machine.

I think movement to nongrowth in Japan is feasible -- dealing with its problems will be no more difficult than dealing with those of continued growth. I also feel it is desirable both for other advanced countries and Japan, since solving the problems of nongrowth goes a long way in dealing with fundamental problems of human happiness that have been ignored for too long in the world of more is better.

FOOTNOTES

¹Copper is used in the electric power and machinery industries, as well as communications, construction and metal products. Lead's main usages are for storage batteries, cables and inorganic chemicals with a variety of applications. Zinc is alloyed in steels, and used in dies and with copper sheet. Aluminum has substituted for steel, iron and copper in construction, electrical and metal product applications. Within this broad overview the weight of each use has of course changed in the course of development.

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Table 1 GNE Growth

1904-11	1911-19	1919-30	1930-38	1904-38
1.94	4.33	1.92	4.90	3.18
1955-62.	1962-69	1955-73		
9.10	10.76	9.79		

Compound annual growth in real GNE; bridge calculations between years shown, which, prewar, are swing turning points in Ohkawa and Rosovsky. Data from Ohkawa and Shinohara.

TABLE 2 SEE NEXT SHEET

Table 3 Overseas Investment 1973 and 1985

	Percentages in:		
	total ^a	Mineral Resources	Smelting and Refining
1 9 7 3	10.3	29.8	4.7
1 9 8 5	80.7	33.8	10.4 ^b

a total outstanding in billions of US dollars.

b about 55% in ferrous metals, 37% in aluminum.

Source: MITI 1975, P.306

Table 4 Japanese Population
(in millions)

Year	1975	2000	2025	2050	2075	2100
Population	111.9	136.7	145.2	148.0	149.0	149.3

Source: Kokudocho.

Table 2 Outstanding Overseas Direct Investment
(millions of US dollars)

	Total	Minerals and Fuels ^a	Minerals ^b	Iron	Copper	Lead & Zinc	Bauxite	Mineral Processing ^c
1958	143	30	211	18	13	5	0	4
59	196	42	211	21	15	6	0	8
60	289	86	301	26	18	8	0	10
61	454	191	421	41	19	22	0	38
62	553	225	411	44	20	24	0	38
63	679	250	371	47	20	27	0	41
64	799	271	311	52	20	32	0	57
65	956	305	321	66	20	41	4	61
66	1,183	377	321	108	33	68	1	67
67	1,453	436	301	136	60	70	1	87
68	2,015	594	291	219	61	152	1	91
69	2,683	892	331	429	154	229	15	129
70	3,595	1,127	311	569	218	305	15	138
71	4,472	1,348	301	590	238	318	16	180
72	6,773	2,273	341	-	-	-	-	240
73	10,270	2,784	271	-	-	-	-	486
74	12,666	3,527	281	-	-	-	-	635

Sources: MITI 1976 and Sekai Keizai

a Resource sector

b Resource sector; component of minerals and fuels, and sum of the four columns of specific metals.

c Manufacturing sector

Table A1 Major Indexes of the Japanese Economy

Prewar (1934-36 constant prices; billion yen)

	GNE	Imports	Exports	Population ^a
1904	7.14	0.64	0.38	na
1911	8.17	0.76	0.57	50
1919	11.47	1.61	0.97	55
1930	14.14	2.43	1.60	64.5
1938	20.73	3.29	3.30	71.0

Postwar (1970 prices; trillion yen)

1955	16.9	0.9	1.1	89.3 ^b
1962	31.1	2.4	2.5	95.2 ^b
1969	63.6	6.2	7.2	102.5 ^b
1975	91.8	10.7	14.1	111.9

a in millions

b excludes Okinawa

Sources: (prewar) GNE: Ohkawa, trade: Yamazawa and Yamamoto, both in Ohkawa and Shinohara 1978; (population and postwar) Sorifu.

Table A2 Ferrous and Nonferrous Metal Production

Prewar

(1934-36 prices,
million yen)

Postwar

1970 = 100

Iron & Steel		Nonferrous Metal		Iron & Steel		Nonferrous Metal	
Production		Production		Production		Production	
1910	40	50		1955	10.2	12.5	
11	50	70		56	12.4	15.0	
12	60	60		57	14.4	16.7	
13	70	70		58	13.6	17.1	
14	80	80		59	18.1	22.3	
15	90	150		60	23.8	29.6	
16	100	250		61	30.1	35.4	
17	130	300		62	30.0	34.7	
18	150	350		63	33.9	39.6	
19	120	400		64	42.1	48.6	
20	200	230		65	43.3	48.3	
21	170	260		66	50.1	54.4	
22	190	320		67	64.8	65.6	
23	210	250		68	72.6	79.2	
24	280	240		69	87.6	92.3	
25	380	230		70	100.0	100.0	
26	450	220		71	96.8	102.0	
27	440	290		72	104.7	115.5	
28	480	230		73	129.4	140.1	
29	660	280		74	128.3	121.4	
30	620	340					
31	590	390					
32	860	390					
33	880	410					
34	1220	360					
35	1540	430					
36	1730	450					
37	1640	550					
38	1960	790					
39	2410	800					
40	2490	560					

Sources: (prewar) LTES vol. 10, (postwar) Sorifu

Table A3 Japan's Share of World Metal Production

	1915	1920	1925	1930	1935	1940	1955	1960	1965	1970	1975	1985 ^a	
	0.3	1.1	1.5	2.5	4.7	5.9	3.0	5.4	9.0	15.7	16.6	16.6	Crude steel
	6.5	7.0	4.7	4.8	4.6	5.0	2.7	5.1	5.9	9.2	11.4	15.1	Copper
	0.3	0.1	0.2	0.2	0.5	0.7	1.7	3.1	3.9	6.0	6.4	9.4	Lead
	0.6	2.2	1.5	1.8	2.5	3.2	4.2	6.0	9.0	13.8	15.9	20.2	Zinc
					1.7	3.5	1.9	3.0	4.7	7.7	8.6	13.6	Aluminum

a 1985 estimates are domestic demand for nonferrous metals, which is about equivalent to domestic production. The steel figure is for production.

Sources: 1915-40: League of Nations Statistical Yearbook; 1955-75: United Nations Statistical Yearbook; 1985: MITI 1975, p.112 (iron and steel), p.140 (aluminum), p.208-9 (others).

339
Table A4
Japanese Supply and
Demand for Iron and Steel
(thousand tons)

Year	Crude Steel				Iron Ore		
	Production	Import	Export	Domestic Demand	Production	Import	Domestic Price ^a
1910	252	3	-	255	67	188	84
11	288	5	-	293	64	125	86
12	330	10	-	340	69	198	92
13	382	8	1	389	71	200	96
14	424	8	0	432	90	299	98
15	514	3	-	517	83	309	147
16	572	7	2	577	101	280	260
17	773	2	6	777	139	297	419
18	813	9	8	814	200	361	439
19	813	12	16	809	211	621	383
20	811	4	9	806	180	662	223
21	832	3	4	831	97	574	177
22	909	15	4	918	78	819	138
23	959	19	4	974	113	893	156
24	1,100	10	5	1,105	75	1,065	139
25	1,300	11	5	1,306	88	1,104	118
26	1,506	34	2	1,538	130	793	112
27	1,685	88	2	1,771	159	937	107
28	1,906	90	3	1,993	158	3,234	114
29	2,294	166	3	2,457	178	1,945	101
30	2,289	70	4	2,355	246	1,974	89
31	1,883	26	-	1,909	208	1,550	70
32	2,398	26	-	2,424	227	1,482	67
33	3,198	105	-	3,303	321	1,524	103
34	3,844	82	-	3,926	432	2,132	101
35	4,704	274	-	4,978	516	3,404	97
36	5,223	242	-	5,465	620	3,780	102
37	5,801	434	-	6,235	602	3,011	172
38	6,471	300	-	6,772	771	2,845	187
39	6,696	214	-	6,910	836	4,548	187
40	6,856	291	-	7,147	1,123	4,690	187

Table A4 (continued)
Japanese Supply and
Demand for Iron and Steel
(thousand tons)

Year	Crude Steel Production	Import	Export	Domestic Demand	Iron Ore Production ^a	Import ^b
1955	9,408	-	367	9,041	1,053	5,193
56	11,106	28	239	10,895	957	6,572
57	12,570	267	62	12,775	975	7,549
58	12,118	-	71	12,047	1,255	7,546
59	16,629	-1	12	16,618	1,140	10,300
60	22,138	4	4	22,138	1,161	13,357
61	28,268	127	3	28,392	1,134	18,644
62	27,546	116	31	27,631	1,252	21,711
63	31,501	4	57	31,448	1,263	24,610
64	39,799	7	59	39,747	1,211	29,552
65	41,161	2	459	40,704	1,257	35,103
66	47,784	4	164	47,624	1,316	40,082
67	62,154	203	51	62,306	1,328	48,390
68	66,893	97	50	66,940	1,068	55,781
69	82,166	105	354	81,917	1,024	68,968
70	93,322	80	468	92,934	793	83,088
71	88,557	29	1,092	87,494	827	92,441
72	96,900	64	286	96,678	850	93,840
73	119,322	132	783	118,671	711	114,655
74	117,131	133	631	116,633	489	116,736
75	102,313	70	1,892	100,491	561	113,271
85	173-178	million of tons				

a implicit deflator for ferrous metal industry

b excludes pellets and ferromanganese

Sources: Tekko Renmei; MITI 1975 and Tekko;
Toyo Keizai, Bukka; LTES vol. 10.

Table A5 Steel Elasticities

1912-38

$$\ln S = -21.1 + 3.01 \ln Y - 0.91 \ln(Ps/Py)$$

(-15.3) (20.7) (-1.2)

$$R^2 = 0.958$$

$$D.W. = 0.63$$

1955-73

$$\ln S = 5.87 + 1.30 \ln Y - 0.37 \ln(Ps/Py)$$

(6.3) (5.3) (-0.9)

$$R^2 = 0.983$$

$$D.W. = 0.63$$

S = crude steel production Y = real GNE

Ps = price of crude steel Py = GNE deflator

see table A17 for cross elasticity with aluminum

Table A6 Iron Ore Sources
(percent^s)

1910	1915	1920	1925	1928 ^a	1930	1935	1940	1955	1960	1965	1970	1975	1985 ^a	
26	27	21	7	NA	11	13	19	17	8	3	1	0.5		Japan
												46		Australia
												18		Brazil
				51				25		19		15		India
								24		16				Malaysia
										19				Chile
								21						Philippines
				40										China
				9				13		43		20		Others ^b

a percentage of imports

b includes shares of named countries if not one of the three largest foreign suppliers

Sources: (prewar) Toyo Keizai: Nihon Boeki Seiran, 1935; (postwar) Tsusho-sangyosho: Tokko Tokei Nempo and Shigen Tokei Nempo, 1976 editions; (1985) MITI 1975.

Table A7
Japanese Supply and
Demand for Copper
(thousand tons)

Year	Production	Import	Export	Domestic Demand	Domestic Price
1910	49.3	0.5	35.9	13.9	-
11	53.4	0.7	34.9	19.2	-
12	62.4	0.2	39.1	23.5	678
13	66.5	0.4	42.7	24.2	646
14	70.5	0.2	45.9	24.8	554
15	75.4	0.4	50.5	17.3	601
16	100.6	3.1	62.6	41.1	1,056
17	108.0	5.6	78.8	34.0	1,102
18	90.3	0.9	41.3	49.9	1,033
19	78.4	27.9	24.3	82.0	860
20	67.0	23.0	11.2	79.6	699
21	55.0	13.2	-	68.2	576
22	54.1	23.4	1.6	75.9	639
23	59.3	6.2	1.9	63.6	719
24	63.1	7.1	2.7	67.5	830
25	66.5	4.3	-	70.8	865
26	67.4	16.5	2.5	81.4	801
27	66.6	13.2	2.8	77.0	750
28	68.2	20.5	3.0	65.7	847
29	75.5	8.5	8.3	75.7	962
30	79.0	2.5	33.2	48.3	719
31	75.8	2.0	26.6	51.2	514
32	71.9	2.0	23.1	50.8	633
33	69.0	17.6	8.5	78.1	769
34	69.6	51.4	12.6	100.4	718
35	69.6	68.2	17.8	120.0	758
36	67.5	53.4	12.4	108.5	877
37	67.3	105.7	12.7	160.3	1,400
38	60.0	104.7	6.8	165.9	1,889
39	70.2	117.2	-	187.4	1,186
40	67.9	145.4	-	213.3	-

Table A7 (continued)
Japanese Supply and
Demand for Copper
(thousand tons)

Year	Production	Import	Export	Domestic Demand	Domestic Price	Inventory Net Increase
1955	107	6	16	101	61	- 4
56	108	40	4	142	74	2
57	108	79	2	167	59	18
58	87	47	2	138	51	- 6
59	128	80	1	216	56	- 9
60	152	155	2	302	58	3
61	169	212	1	373	54	7
62	150	157	2	299	54	6
63	140	203	1	359	51	- 9
64	179	280	2	458	54	- 1
65	186	249	3	430	64	2
66	207	279	1	485	87	0
67	181	442	1	617	80	5
68	186	519	12	692	83	5
69	231	598	15	799	100	15
70	216	654	47	824	100	- 1
71	219	639	11	810	75	37
72	220	763	25	967	68	- 9
73	241	1,024	24	1,205	97	36
74	209	1,018	279	877	118	70
75	167	820	22	838	75	127
85	300	1,560	0	1,860		0

a production from domestic scrap

b yen per ton

c 1970=100

Sources: MITI 1964, 1975 and Shigen; Toyo Keizai, Bukka; Nihon Ginko

Table A8 Copper Elasticities

1912-38

$$\ln C = -12.37 + 1.80 \ln Y - 0.25 \ln(P_C/P_Y)$$

(-6.9) (9.8) (-1.7)

$$R^2 = 0.798$$

$$D.W. = 1.10$$

1955-73

$$\ln C = 1.31 + 1.28 \ln Y - 0.12 \ln(P_C/P_Y)$$

(4.7) (16.2) (-0.6)

$$R^2 = 0.959$$

$$D.W. = 1.25$$

C = domestic copper demand Y = real GNE

P_C = copper price P_Y = GNE deflator

see table A17 for cross-elasticity with aluminum.

Table A9 Copper Ore Sources

1910 1915 1920 1925 1930 1935 1940 1955 1960 1965 1970 1975 1985^a

99	100	75	94	97	51	32	95	50	42	20	17	16	Japan
										19		26	Canada
							3		21		23		Philippines
											11		Bismark Isl.
										4			Australia
							1						Formosa
							1		14		23		Others ^b

Sources: See Table A6

a. estimate

b. see note b Table A6

Table A10
Japanese Supply and
Demand for Lead
(thousand tons)

Year	Production	Import ¹	Export	Domestic Demand	Domestic Price
1910	-	11.7	-	11.7	-
11	-	14.7	-	14.7	-
12	-	18.2	-	18.2	177
13	-	15.7	-	15.7	195
14	-	16.1	-	16.1	200
15	-	15.7	-	15.7	245
16	-	21.8	-	21.8	390
17	-	16.3	-	16.5	396
18	-	36.8	-	36.8	430
19	-	36.3	-	36.3	266
20	-	21.4	-	21.4	366
21	-	38.6	-	38.6	231
22	-	44.6	-	44.6	240
23	-	44.8	-	44.8	262
24	-	44.2	-	44.2	381
25	4.0	40.9	-	44.9	439
26	3.9	55.1	-	59.0	346
27	4.2	56.0	-	60.2	269
28	3.4	62.6	0.6	65.4	235
29	2.9	61.0	0.6	63.3	257
30	2.8	56.2	0.6	58.4	195
31	4.8	53.9	0.5	58.2	140
32	5.3	56.0	0.5	60.8	172
33	6.2	67.3	0.8	72.7	203
34	6.1	95.1	2.1	99.1	206
35	7.7	91.4	1.9	97.2	250
36	9.2	97.8	2.3	104.7	311
37	10.0	98.7	2.0	106.7	550
38	10.4	60.7	1.9	69.2	780
39	12.0	101.0	1.4	111.6	370
40	14.5	92.1	1.1	105.5	-

Table A10 (continued)
Japanese Supply and
Demand for Lead
(thousand tons)

Year	Production	Import	Export	Domestic Demand	Domestic ^a Price	Net Inventory Increase
1955	27.5	13.7	0.1	40.5	106	0.6
56	37.1	27.2	0.1	65.5	115	- 1.3
57	36.0	50.2	0	81.9	112	12.3
58	32.8	12.1	0	50.5	92	- 5.6
59	43.6	22.0	0	71.4	87	- 5.0
60	40.0	40.0	0	95.3	80	1.5
61	52.8	74.0	0	123.2	79	4.4
62	57.5	50.0	-	113.0	71	- 4.7
63	64.4	57.1	-	123.6	69	- 2.1
64	76.4	95.1	-	162.6	85	0.9
65	73.4	73.9	4.9	146.6	100	- 4.2
66	84.4	57.2	4.4	143.0	88	- 5.8 4.4
67	82.9	85.2	-	160.9	79	7.2
68	82.7	93.5	-	178.4	70	- 2.2
69	83.2	110.8	-	185.3	90	8.5
70	94.4	115.4	3.2	206.7	100	- 0.1
71	102.9	115.0	2.0	207.3	85	9.4
72	99.8	127.7	5.2	225.4	85	- 3.1
73	99.5	107.1	3.0	200.7	100	2.9
74	90.7	166.0	28.0	208.9	151	19.8
75	95.3	114.7	25.5	202.0	115	- 17.5
85	120	260	0	390		0

See Table A7 for notes and sources.

348
Table A13
Japanese Supply and
Demand for Aluminum
(thousand tons)

Year	Production	Import	Export	Domestic Demand	Domestic Price
1910	-	0.5	-	-	-
11	-	0.4	-	-	-
12	-	1.0	-	-	605
13	-	0.3	-	-	719
14	-	0.5	-	-	813
15	-	0.5	-	-	869
16	-	0.8	-	-	2,703
17	-	1.0	-	-	2,007
18	-	0.9	-	-	1,888
19	-	1.5	-	-	1,654
20	-	2.0	-	-	1,474
21	-	1.8	-	-	1,012
22	-	4.0	-	-	790
23	-	3.7	-	-	840
24	-	4.2	-	-	1,001
25	-	4.7	-	-	1,250
26	-	7.5	-	-	1,168
27	-	6.0	-	-	1,029
28	-	9.3	-	-	1,002
29	-	12.3	-	-	927
30	-	11.7	-	-	843
31	-	5.2	-	-	635
32	-	8.3	-	-	941
33	-	7.2	-	-	1,414
34	-	10.1	-	-	1,236
35	-	13.4	-	-	1,370
36	-	10.2	-	-	1,292
37	-	11.4	-	-	1,495
38	-	23.8	-	-	1,710
39	-	-	-	-	-
40	-	-	-	-	-

Table A13 (continued)
Japanese Supply and
Demand for Aluminum
(thousand tons)

Year	Production	Import	Export	Domestic Demand	Domestic Price	Inventory Net Increase
1955	-	57.5	24.1	33.4	94	-
56	-	68.6	9.4	59.2	95	-
57	-	77.5	4.6	72.9	102	-
58	-	85.1	10.8	74.3	101	-
59	-	115.5	7.4	107.6	99	-
60	-	162.3	8.6	153.7	99	-
61	-	102.6	0	104.1	97	- 1.5
62	-	107.9	5.5	174.7	96	7.7
63	-	239.3	14.1	224.9	96	0.3
64	-	202.9	19.2	261.1	91	2.6
65	-	314.0	29.1	274.5	91	10.4
66	-	380.3	18.7	378.1	91	- 16.5
67	-	522.6	1.9	496.8	93	23.9
68	-	621.1	1.3	622.8	94	- 3.0
69	-	837.8	3.0	821.6	98	13.2
70	-	965.5	2.7	943.1	100	19.7
71	-	1,076.9	20.0	988.5	96	88.4
72	-	1,302.5	5.1	1,290.5	91	6.9
73	-	1,525.1	0	1,546.8	95	- 21.7
74	-	1,542.7	30.0	1,306.4	136	206.3
75	-	1,352.1	77.4	1,102.4	142	172.3
85	-	3,100	0	3,100		0

See Table A7 for notes and sources.

Table A14 Zinc Elasticities

1912-38

$$\ln Z = -16.03 + 2.09 \ln Y - 0.0064 \ln(P_Z/P_Y)$$

(-9.4)
(11.9)
(-0.053)

 $(-9, 4)$

(11.9)

 (-0.053) $R^2 = 0.850$
$$D.W. = 1.24$$

1955-73

$$\ln Z = 2.47 + 0.94 \ln Y - 0.53 \ln (P_z/P_y)$$

(8.9) (14.0) (-4.2)

(8.9)

(14.0)

 $(-4, 2)$ $R^2 = 0.993$

D.W. = 1.95

Z = domestic zinc demand

Y = real GNE

Pz = zinc price

Py = GNE deflator

Table A15 Zinc Ore Sources

1915 1920 1925 1928^a 1930 1935 1940 1955 1960 1965 1970 1975 1985^b

72	67	38		47	43	72	99	74	62	44	45	24	Japan
		34									19		Canada
									21		18		Peru
		33				0.5			3		8		Australia
									5				Mexico
						0.5							India
		27											USA
		6							10		10		Others ^C

34

19

Canada

21

18

Peru

33

0.5

3

3

Australia

5

Mexico

0.5

India

27

USA

6

10

10

Others^C

Sources: See Table A6

a percentage of imports

b estimate

c see note b Table A6

Table A16
Japanese Supply and
Demand for Zinc
(thousand tons)

Year	Production	Import	Export	Domestic Demand	Domestic Price
1910	-	5.8	-	5.8	-
11	-	7.1	-	7.1	-
12	-	9.4	-	9.4	311
13	-	13.5	-	13.5	259
14	5.9	0.2	-	0.2	242
15	21.1	0.2	-	14.1	242
16	39.0	5.8	23.2	21.6	623
17	54.7	6.5	36.8	24.4	413
18	39.9	4.5	17.0	27.4	493
19	19.8	22.7	5.7	36.8	399
20	15.7	7.7	0.2	23.2	393
21	10.4	21.6	-	32.0	306
22	12.5	41.0	1.1	53.2	347
23	13.8	34.5	-	48.3	370
24	14.1	32.3	-	46.4	433
25	17.0	27.9	-	44.9	492
26	17.0	40.4	-	57.4	432
27	17.5	31.6	-	49.1	380
28	19.1	41.2	-	60.3	347
29	22.1	33.3	-	55.4	346
30	24.7	27.4	-	52.1	247
31	25.4	24.6	-	50.0	198
32	27.0	26.6	-	53.6	301
33	30.7	32.5	-	63.2	379
34	32.1	33.2	-	65.3	361
35	34.2	45.8	-	80.0	357
36	39.1	61.8	-	100.9	363
37	49.2	61.8	-	111.0	676
38	56.1	46.7	-	102.8	853
39	57.4	60.8	-	118.2	545
40	61.1	24.3	-	85.4	-

Table A16 (continued)
Japanese Supply and
Demand for Zinc
(thousand tons)

Year	Production	Import	Export	Domestic Demand	Domestic Price	Net Inventory Increase
1955	115.3	1.5	4.5	109.1	118	3.2
56	127.4	12.7	15.0	117.5	114	7.6
57	129.7	18.3	11.7	131.4	110	-1.1
58	132.0	14.5	7.2	135.8	106	3.5
59	148.2	16.7	8.7	160.6	104	-4.4
60	148.8	53.0	5.9	195.4	99	0.5
61	153.7	102.8	1.3	247.8	98	7.4
62	184.0	71.9	0.3	251.9	85	3.7
63	215.3	81.7	1.1	300.5	80	-12.6
64	215.9	169.2	5.3	361.4	102	18.4
65	235.8	142.9	55.2	334.9	102	-11.4
66	269.5	185.3	54.9	399.6	95	0.3
67	294.6	241.4	65.2	464.6	90	6.2
68	279.3	337.6	85.2	526.8	88	4.9
69	309.9	414.5	90.4	609.1	93	24.9
70	308.9	393.2	52.6	638.4	100	11.1
71	331.4	401.9	63.0	646.9	107	23.4
72	350.0	466.5	106.6	706.4	108	3.5
73	329.3	541.7	64.0	813.9	128	-6.9
74	325.1	549.4	116.1	784.6	201	53.8
75	322.4	397.4	52.8	563.0	217	104.0
85	420	1,300	160	1,560		0

See Table A7 for notes and sources.

Table A17 Aluminum Elasticities
and Cross-Elasticity with Copper and Steel

1912-38

$$\ln A = -32.79 + 3.77 \ln Y - 0.66 \ln(P_A/P_Y)$$

(-10.6) (12.0) (-3.4)

$R^2 = 0.869$
D.W. = 1.41

1955-73

$$\ln A = -5.12 + 2.84 \ln Y + 1.58 \ln(P_A/P_Y)$$

(-3.1) (7.0) (2.0)

$R^2 = 0.986$
D.W. = 1.27

$$\ln A = 1.76 + 1.12 \ln M - 0.24 \ln(P_A/P_C)$$

(12.1) (35.1) (-1.9)

$R^2 = 0.993$
D.W. = 1.07

$$\ln A = -6.90 + 1.63 \ln B - 1.26 \ln(P_A/P_S)$$

(-16.1) (29.7) (-1.8)

$R^2 = 0.981$
D.W. = 1.18

A = domestic aluminum demand Y = real GNE

P_A = aluminum price P_Y = GNE deflator

P_C = copper price P_S = steel price

M = machinery industry production in real terms

B = construction expenditure in real terms

Table A18 Bauxite Sources

1928 ^a	1955	1965	1975	
		23	58	Australia
	51	29	17	Indonesia
	42	36	13	Malaysia
38				USA
16				Switzerland
11				Germany
35	7	12	12	Others ^b

Japan has always imported all of its bauxite.

^a Aluminum imports

^b Includes listed countries when they are not one of the three largest suppliers.

Sources see table A6.

OPTIONS FOR A RESOURCE-POOR COUNTRY -- JAPAN

A COMMENT

Hugh Patrick

This is a very ambitious and provocative paper, with the broad perspective of a long time horizon, consideration of Japan's basic options in historical and future perspective, and indeed a blueprint for the creation of a new society and a new kind of man in Japan in the 21st century. In addition, the paper traces Japan's evolving production, domestic demand, and imports and exports of major minerals in their raw and refined forms -- with steel as the most extreme degree of refining.

I focus my comments on the author's discussion of Japan's major policy options, rather than touching on a number of interesting issues of detail. My understanding of Mr. Murota's position is as follows.

Japan as a nation selects a fundamental long-run objective, the desired national destiny as it were, which serves in general terms as the guiding framework of economic policy -- and indeed much more -- for some decades. Since the mid-19th century the target has been to catch up with the advanced Western nations. For the first three-quarters of a century this was perceived in terms of the combination of economic and military power within a global context of imperialism -- Japan first resisting Western imperialism at home, and then itself engaging in the imperialist game abroad. Since World War II, with military power destroyed and rejected by Japan, and with colonialism coming to an end, Japan has pursued -- and achieved -- economic power through rapid growth.

Japan now finds itself and the world in a transitional phase, with substantially less than the high degree of stability that had existed until the beginning of this decade. The world can no longer rely on the overwhelming leadership of a single nation, the United States,

because of the changes in relative economic power brought about by rapid economic growth in Western Europe, Japan, and many of the developing nations, especially those of the Pacific, as well as by the cartel power of the OPEC nations. Moreover, tremendous resource problems -- actual and especially potential -- make Japan all the more aware of its dependence upon, lack of control over, and hence vulnerability to, external sources of supply. Japan has caught up with the West in the economic power game, and the military power game has been rejected. Moreover, Japan is beset with a number of the domestic problems of affluence: pollution, excessive urbanization, young worker alienation, and a sense of lack of values. Domestic political stability as embodied in the twenty-year plus dominance of the Liberal Democratic Party has so eroded that political realignment appears inevitable. Japan has no transcendental vision -- or target -- to guide its future destiny.

As Mr. Murota stresses very effectively in his paper, Japan now and in the future, as in the past, faces three basic options: to place emphasis upon fairly rapid economic growth and to obtain requisite natural resources through market arrangements of purchase and foreign investment; to use military power to obtain natural resources by force; or to sharply reduce foreign mineral and other raw material dependence by becoming essentially a steady-state economy with negligible GNP growth, and recycling of natural resources in an altered economic structure.

Mr. Murota rejects the military option on very rational grounds. Historically it did not work, and is unlikely to work in the future. Moreover, any such attempt would be economically very expensive (the cost-benefit ratios are way out of line).

The most innovative part of the paper lies in the author's judgment that Japan should seriously explore the possibility of the third option as a long-run solution. He does not completely reject the first option of relatively rapid growth and active involvement in the Pacific and global economy, but he points to a number of problems: difficulties of raw materials supply, though he notes that the only

longer-run issues revolve around oil and energy, not other minerals; problems in earning foreign exchange for imports due to restrictions in export markets; the domestic external diseconomies of rapid growth already noted; and the lack of need to grow fast since catching up has been achieved.

Mr. Murota sees slow -- or no -- growth as a feasible and also a desirable option. He recognizes it will take until the end of the century to effect the transition. However, projections of zero population growth in the next century provide one condition for a steady state solution. He suggests the economic structure would be based more on agriculture and small-scale handicrafts; I assume he means really a highly sophisticated technology, high degree of labor skills, and a large capital stock combined in some new forms of "handicrafts" rather than reversion to a simplistic Gandhian view of the world.

How do I respond to this analysis? At first I rejected the idea of Japan having a simple, overreaching target since it sounds as if Japan is a completely planned, government-run economy. That is certainly not the case; Japan has one of the most dynamic, competitive, market-oriented private business sectors in the world. Yet in a more subtle, looser sense Mr. Murota may be right about such targets as a broad frame of reference -- just as postwar the American "manifest destiny" has been to be Number One and to contain Communism, and that of the Soviet Union to bury capitalism.

Most of this conference, and indeed most discussion generally, focuses, not only for Japan but for all Pacific nations, on variants and suboptions within the general market and growth oriented option. To what extent should Japan purchase mineral ores, and smelt, refine, and process in Japan? Or import smelted or even finished raw materials-based goods? How should sources of supply be handled: geographic and political diversification versus concentration; foreign investment and ownership, spot purchase, or long-term contract? How about pricing, and stockpiling? Bilateral, regional, or global arrangements? Mr. Murota does not spend much time considering such

alternatives, in part because they are considered elsewhere. Though I was initially disappointed, I have come to the view that it is very appropriate to have at least one paper at this conference which lays out the broadest possible range of alternatives. And I welcome too his addressing these issues in a long-term perspective encompassing prewar Japanese experience and behavior; all too many Japanese analyses, as the author notes, assume the world began in 1955 or so. I do nonetheless wish he had explored more the trade-offs between options one and three.

Will the long-run difficulties and problems of international, market-oriented rapid growth (the first option) be as severe as Mr. Murota implies? Should the Japanese choose the third option of a steady state economy in the 21st century? Will they? If so, can they successfully achieve it without severe societal strife?

I am an optimist where Mr. Murota is a pessimist, and vice versa. Because I am relatively optimistic that the nations of the Pacific and the entire world will be able to work out a new market-oriented international economic system -- whether by negotiation or the evolutionary process of market forces -- I regard the first option as not only viable but desirable for Japan and indeed for all nations. On the other hand, I am not so optimistic that Japan will be able to achieve the steady-state solution harmoniously and happily. When it comes down to it, I doubt that the Japanese will adopt this as their fundamental vision of the desired future for Japan. The inherent dynamism of the Japanese people and their society -- the strong work ethic, the pragmatic curiosity, the materialism -- will have to undergo radical transformation if zero growth is to be achieved without massive unemployment and social tensions. Moreover, it is always more difficult to reallocate resources to meet evolving private and social needs in a no-growth economy.

The implications for the rest of the Pacific of a Japan transiting to no growth by the end of the century are enormous, politically and economically. The recent, and ongoing, recession has demonstrated that one thing worse than a fast-growing Japan is a slow-growing Japan.

While the developing countries of the Pacific -- and Australia as well -- might be happy to reduce their trade dependence on Japan, it would be at the great cost of loss of potential export markets and of reduction in the competitiveness of alternative sources of manufactured imports. Certainly the United States and all countries reaping the benefits of specialization, trade, and international competition would benefit less from a no-growth Japan than a fast-growth Japan, despite the various adjustment problems that inevitably arise. Also, I have the vision of Japanese with so much leisure time that one-quarter of the population at any time will be traveling abroad, with all that implies.

Why is Mr. Murota so much more pessimistic about the future -- intermediate and long-run -- than I? I doubt it is due to differences in personality; we are both outgoing, nice guys. Nor is it due to a difference in views on long-run supplies of non-oil minerals: we both do not regard those as insurmountable, or even major, problems. Our real difference lies, I think, in our different perspectives on energy supplies between the mid-1980's and the end of the century. My guess is that Mr. Murota is much more worried than I that oil will run out, or that Japan will not be allowed to purchase as much oil as it needs, and that R and D and other investment will not create alternative energy sources sufficiently rapidly to avoid an energy crunch. I may well be too sanguine about future energy difficulties. I thus would like to ask Mr. Murota whether, if energy supplies should be made secure for Japan over the coming 25 years, will option three still be preferred to option one?

OPTIONS FOR A RESOURCE-POOR COUNTRY -- JAPAN
A COMMENT

Lawrence L.C. Chau

Mr. Murota has written a stimulating paper in which he takes a historical sweep of the twentieth century in order to categorize Japan's resource strategy of the past and to prescribe a course for the future. It is done in the grand tradition of the "magnificent dynamics" which interpret history in economic terms.

The underlying framework is quite straightforward. It is suggested that, as a resource-poor country, Japan has three options with regard to securing natural resources:

- (1) by trade;
- (2) by military conquest; and
- (3) by economizing the need for resources, i.e. by economic depression.

In the 1930's Japan opted for the military solution, with catastrophic results both for herself and for her neighbors. Since the 1950's she has been pursuing Option 1 with admirable success.

Since Option 2 is, hopefully, of historic interest only, for Japan or for other nations, we can confine ourselves to the other two options. It is somewhat disappointing that Mr. Murota did not dwell on factors contributing to Japan's success in pursuing Option 1, particularly the role played by mineral resources, and to draw some lesson for other developing countries. But then the thesis of his paper lies clearly in the future options of Japan. Particularly, he advocates that "Japan should seriously consider pursuing a road of slower economic growth."

Such a policy of growth deceleration will take several forms: (1) more emphasis on recycling of used resources, (2) shift of investment to social capital or housing and away from plant and equipment,

and (3) a lowering of the economic growth rate. Though specific measures for bringing about these changes have not been spelled out, it is clear that the author has in mind public planning and policy. Supposedly, government can intervene through prices, credit and taxation to bring about a redirection of resources.

Three sets of considerations are offered to support this particular policy recommendation.

- (1) Internal conditions. In view of the high living standard Japan has already attained, there will be less incentive for further growth; specifically, people would be less inclined to bear the increasingly heavy environmental cost of growth.
- (2) Changes in external conditions. The trading environment has become more unstable and less favorable. A continued heavy dependence on raw material imports will expose Japan to shock from outside.
- (3) Resources are more necessary and more profitable for use in developing countries.

I would like to take up these issues in their reverse order: whether a deliberate go-slow policy will benefit developing countries; whether such a change is imposed by changed conditions in international trade; and the potency of domestic factors. I do not share the view that a slowing-down policy in the way the author envisages would benefit the economic growth of developing countries by releasing resources for their use. The direct result of a slower growth of Japan or an increase of recycling is a reduction of her demand for such resources. Indirectly, Japanese exports will be more expensive for a number of reasons: (1) with a smaller total output the scale economies will be less, (2) recycling is more expensive, and (3) Japan will have a smaller total demand for import so that her export volume will be smaller. In sum, there will be a decline in Japan's offer curve of her manufactured merchandises for raw materials. Both the price effect and the income effect will work against the welfare of the raw material exporting countries. In addition, Japan's ability to offer aid will also be impaired by a slower growth. To be sure, the raw material producing countries, or other developing countries can industrialize

and make use of these resources. But the fact that they have not done this before would suggest that they are less efficient users. Indeed it may take a long time for them to fully utilize such resources, so that the short-run consequences are simply idle mines and idle workers.

Secondly, is Option 1 still feasible in the foreseeable future? Or is it time that, as the author put it, "the necessary conditions for this choice are now collapsing"? This hinges largely on the question of how real and serious is the impending raw material shortage. From discussions of yesterday and this morning, we can summarize that this is at best a debatable issue. The ability for resource-producing countries to improve their terms of trade through the formation of producer cartels should not be overestimated. Most raw material producing countries have achieved a degree of economic development when the functioning of their economy is highly dependent on imports from developed countries.

The remaining causes for a slowing down, namely a smaller incentive for further growth and a growing concern over environmental quality, are very real. And such changes are in accord with economic theory. After all, leisure, environmental quality, and culture are all luxury goods, the demand for which will go up with income. This shift of consumer preference may well prevail in other developed economies which are major markets for Japanese exports, in which case it will be another braking force to Japan's growth.

In sum, I am more optimistic than Mr. Murota about the options for Japan. Option 1 is still open to her to maintain a high rate of growth through trade. The road may be a bit more rough going, now that she has to spend as much attention in securing the supply of imports as in cultivating her export markets. But then ingenuity is not exactly scarce in Japan. If a drastic slowing down did occur, it would likely be largely the outcome of her own discretion, the result of a reorientation of national priorities; and not something forced upon her by scarcity of primary resources or by the changing environment of international trade.

I have two other comments to make, upon which I do not have time to elaborate.

- (1) The framework can be usefully extended in a number of ways. Within these three big boxes (labelled options 1, 2, and 3) are many smaller boxes of degrees and variations. Indeed some of these smaller boxes may be qualified for independent status, raising the number of options. For example, regional cooperation, trade block, or economic union will be such an alternative.
- (2) The author has estimated a number of demand functions for major minerals for the period 1955-73. The relevance and interpretation of such a relationship for an export-oriented country over a period of substantial structural changes are open to question.

OPTIONS FOR A RESOURCE-POOR COUNTRY -- JAPAN
GENERAL DISCUSSION

Catching up with the West for Japan has meant to a large extent adopting Western patterns. Japan's very success has now brought about a feeling of alienation and isolation leading to a craving for a return of some of Japan's own cultural traditions. These traditions are consistent with aspects of the third option. While several speakers feel the option is seriously considered only by intellectuals in Japan, one Japanese noted that there is in fact a broader segment of the population searching for a new value system, and the third option is a part of what is considered.

It may be a rational choice for Japanese to opt for slower growth, especially insofar as high growth has come from a high savings rate. Not only is postponed consumption perhaps becoming less acceptable, the desired consumption bundle is not what Japan is currently producing -- which contributes to Japanese companies exporting. On the other hand, a Japanese noted there are population segments still desirous of obtaining the consumer durables the upper middle class has acquired.

The third option discussion is not limited to Japan. In Europe, the British disease has become the British example, as growth is being rejected and new consumption patterns emerge.

The implications of the option for Japan include higher taxes, since much of what the Japanese want is public goods. The biggest transition will be in the capital markets, and it is not clear how this will be done. There will also be a need for freer trade, meaning greater interdependence among nations. The catch is whether this will be accepted by Japanese and Europeans.

Freer trade as a result of option 3 is certainly beneficial to other countries. Further, a number of participants from Asian developing countries said their countries would be happy to be free of Japanese competition for markets, and felt the resulting growth of

their economies would absorb the resources such countries as Australia have sold to Japan. However, none of them felt the possibility realistic enough to suggest development planning based on it.

To most participants, option 3 cannot be seen as economically necessary. Some wondered if it was a pessimistic reaction to the energy crisis. Many Japanese seriously advocated slower growth and other aspects of option 3 when it looked as though very serious constraints were being put on Japan's supply sources, including energy, and markets. However, economizing resources does not inherently imply slower growth. It does require structural change. While historically Japan has been able to handle such situations, it was in the context of overall growth. Things may not be so easy with no, or slow growth.

"No growth" in Japan frequently is used to mean 5 to 6 percent, and while Murota means something less, indeed, ultimately zero growth, most participants do see Japanese growth slowing to the 5- to 6-percent level.

While a useful starting point for exposition, many felt the options too starkly drawn, and saw a continuum between 1 and 3, with 2 being recognized as improbable.

One speaker suggested the paper was not at all realistic in its description of what Japan is now: it is not a country of wasteful consumers, it is in fact high-technology intensive, and very protectionist. What Japan needs to do is grow in a nice manner rather than elbowing others around.

The difference between the prospects for Japan's home islands -- the physical Japan -- and offshore Japanese enterprise was noted. The latter enjoys positive development prospects even while the former is constrained. (The speaker saw immense growth in Japan's overseas investment position in the next generation.) Japanese firms have demonstrated the ability to act as brokers, wedding modern technology to cheap labor, and they have done this in a number of geographical and cultural settings.

The question here is what happens to the rents. The Japanese firms may decide to keep them offshore to continue to satiate their

entrepreneurial desires. (One developing country participant had earlier noted option 2, while not done with armed troops, was in many ways being done with Japanese businessmen taking control of host country resources and markets.)

From the standpoint of general equilibrium analysis, at least as seen at the University of Chicago, if there were truly resource constraints, a movement toward option 3's slower growth would be an automatic adjustment. If a change of preferences is the reason for going to option 3, it follows that trade will be reduced, but there is not going to be more leisure, as implied. Only with a change in resource endowments such as mentioned above -- with the moving of some economic activities offshore -- is option 3 possible without a good deal of government intervention to make it happen.

ISSUES IN THE DEVELOPMENT OF RESOURCE-RICH LDCs:
COPPER IN CHILE*

Ernesto Tironi**

The debate about the pros and cons of natural resources-based development strategies is a very old one. It goes back to Adam Smith and his implicit development theory through free trade. The topic has become popular again as a consequence of the general price boom of raw materials in the early seventies, the success of the oil cartel, the renewed discussion about the world scarcity of natural resources and the relative frustration with development policies based on import substitution.

Many less developed countries are rich in some natural resource, but not in a wide variety of them. Accordingly, raw materials account for a large proportion of their GNP and exports. This is probably the most important difference between underdeveloped and developed nations. The main consequence of that situation is the existence of a structurally unbalanced economy which is very sensitive to conditions prevailing abroad. In this sense, at the least, they are more "dependent."

Hence, the large availability of natural resources has often been, and still is, a mixed blessing. This is not because economic development could have been higher without those resources, but because their exploitation may have prevented a more systematic and balanced

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domestic development effort. A nation's attitude towards work is probably less favorable when it sees that progress is not as much the result of its own productive effort, but rather of strong forces outside its control.

The contribution of natural resources to a country's development obviously depends on the type of resource available, especially its value or price, its cost, factor intensity of production and forward and backward "linkages" with the rest of the economy. But it also depends very heavily upon their ownership pattern, on the conditions under which natural resources are exploited and on the use made of the revenues obtained from them. The latter two are critically influenced by the economic policies followed by the countries concerned.

The purpose of this paper is modest. It seeks to highlight the problems and the importance of adequate economic policies in dealing with natural resources in a less developed country. It draws on the experience of Chile with copper only, and there is no attempt to imply that the lessons derived from it are applicable to all developing nations or to all natural resources. On the one hand, copper is an exhaustible mineral which is different in that sense from agricultural commodities. On the other hand, Chile is a semi-industrialized country with an income per capita significantly higher than most raw material exporting countries, it has a large public sector with relatively educated public officials, and a trained local labor force, technicians and administrators who have been running the copper mines for many years.

The more specific thesis of this paper is that, in the case of countries such as Chile, there is a relatively broad margin within which the contribution of natural resources to development can be increased by the use of appropriate government policies. This is true whether firms exploiting natural resources are foreign or domestic, private or public. On the contrary, laissez faire or free trade policies can hardly maximize that contribution, and inadequate policies can considerably reduce it.

Section 1 introduces the subject with a brief presentation of the debate about the general pros and cons of natural resources-based

development strategies as well as their limitations, on the one hand, and the main issues and problems that must be addressed in relation to natural resource development, on the other hand. Section 2 describes the characteristics and importance of copper in the Chilean economy. Section 3 analyzes the main copper mining policies followed in Chile since the early fifties and the lessons derived from that experience. Finally, Section 4 raises some of the main issues posed by a long-run development strategy based on the exploitation of a natural resource such as copper in the case of a small country like Chile.

1. Natural Resources-Based Development

Until the Great Depression in the 1930s most less developed countries had based their development mainly on the export of natural resources, following a classical free trade pattern. The Depression dramatically showed how feeble that strategy was for small countries that depended too heavily on foreign trade.¹

The General Debate

Classical and neoclassical economists give considerable attention to free trade as a stimulus to development.² They stress mainly the gains that result from better allocation of world resources, cost reductions as a consequence of economies of scale and greater competition. Free trade is considered to be mutually beneficial to all trading countries, except in very special cases of monopoly power in world markets (that may reduce a nation's terms of trade as exports become very large) and of infant industries.³ Free capital and labor movements are also mutually beneficial since they would tend to raise wages and lower interest rates in the borrowing countries. Finally, balance of payments disequilibriums can always be faced by relative price changes, even assuming no automatic gold movements.

Aside from the Marxist critique of exploitation, many modern economists question whether the classical theory is relevant for poor countries and whether free trade is the best development policy they

can follow. On the one hand, they question the validity of basic assumptions of the classical theory in the case of less developed countries: that there is full employment, domestic resources are perfectly mobile, private marginal products equal social marginal products, and that all prices are flexible. On the other hand, they maintain that the classical theory is a static theory in so far as it assumes given tastes, resources and technical knowledge. These assumptions imply that the essence of development problems are missed.

Accelerating development would not be so much a problem of achieving an optimum allocation of resources under static conditions as it is of increasing the supply of resources and allocating them under dynamic conditions. Thus, they conclude that, under free trade, the gains from trade go mainly to the developed countries, and that development requires basic structural changes and deliberate public policies influencing trade patterns.

The "structuralist theory" of development -- advanced by Prebisch (1950), Singer (1950), Myint (1954), Lewis (1955), Myrdal (1956) and a few others -- bases its criticism of free trade, and its new policy recommendations, on three empirical arguments. First, less developed countries "freely" opened up to world markets become "dual economies": exports are concentrated in one or a few natural resources which form an enclave, isolated from the rest of the economy. Hence, they do not contribute much to the development of the latter, since there is no large demand of inputs from the local economy (few "backward linkages"), little domestic processing of output ("forward linkages"), there is not much contribution to the domestic supply of entrepreneurship nor imitation of techniques used in the export sector. The main linkage of the domestic economy with the export sector is through taxes. Finally, the economy becomes unstable through the transmission of large external fluctuations in demand and prices that produce pressures on the balance of payments.

The second argument has been that free international factor movements are not entirely beneficial. Under "laissez-faire" conditions they tend to concentrate in natural resources for exports with

little positive effects on the rest of the economy for the reasons mentioned above. This is especially true when natural resources exploited through foreign capital are minerals rather than agricultural commodities. In these cases, capital flows are not as much accompanied by the immigration of labor -- which has been the main vehicle for transferring technical know-how to developing regions in the last century -- as had been the case in the US and Australia.⁴

The third major argument against free trade development policies has been the contention that there has been a secular deterioration in the developing countries' terms of trade. Prebisch, for instance, argued that the benefits from technological progress had gone primarily to the advanced countries that exported manufactured products and not to the developing countries exporting raw materials in exchange.

The main implication for development derived from these arguments in the early fifties was the decision to use commercial policies in order to grow by substituting imports of manufactured products. These policies were widely implemented, especially in Latin America, as a consequence of both the popularity of Prebisch's ideas transmitted through the United Nations' Economic Commission for Latin American (ECLA) -- headed by him in the late 40's and during all the 50's -- and of the experiences of the Great Depression and The Second World War.

The main shortcomings and criticisms of the import substituting development strategy have been sufficiently analyzed in the modern literature⁵, so there is no need to review it here. The way to overcome those shortcomings during the last decade, however, has been mainly to promote exports of manufactured goods rather than expanding natural resource exports.⁶

As a consequence, since the Second World War the natural resource sector has not been a high priority area in most developing countries, and certainly not in Latin America. There has seldom been any explicit policy at all for its development, except for an erratic nationalistic general trend seeking to gain more control over multinational corporations exploiting natural resources.

The classical and neoclassical theories -- being based on assumptions of little relevance for LDCs -- can hardly provide meaningful policy orientations for an effective development through the exploitation of natural resources. The structuralist theory, on the other hand, although much more realistic and accurate in its diagnosis of the problems involved, has not been able to provide effective policy orientations to overcome those problems. Its followers tend to present solutions in simplistic "all or nothing" terms without paying sufficient attention to problems of specific policies and public sector organization for implementing them. Thus, for instance, the answer to terms of trade reduction was to support the substitution of any imported manufactured product, with little regard for social costs, and implicitly to discourage all production of natural resources, without considering their specific varieties and costs.

Finally, development theories have paid little attention to the problem posed by the instability of natural resources revenue and the means to cope with it. The problem has become more urgent recently as a consequence of the nationalization of many former foreign enterprises.

The rest of this section considers some crucial issues about natural resources development which have not been sufficiently considered, but we will reserve the analysis of the instability problem for the last section.

Strategic Issues in Natural Resources Development

There are several general issues that must be addressed by a country in relation to the development of its natural resources. Three of the major ones are: (a) the sector's role vis a vis other sectors in the economy; (b) whether to have foreign or domestic ownership of firms exploiting them; and (c) the organization of the public sector to regulate that economic activity.⁷

Aside from a country's factor endowments, or the purely technical efficiency with which it can produce, the position of its natural resources sector in the economy as a whole is determined, first, by the

global economic system and the ownership structure of the country involved; and second, by the specific government policies followed within that system. If all of the sector is publicly-owned and a direct or centralized planning system is used, natural resource development will depend on the targets set by government authorities. In a normal market economy, development will depend mainly on the indirect or "market" policies used by the government, aside from the signals provided by markets alone.⁸ In a "mixed" economy, or one with a nationalized sector operated mainly by public enterprises, the sector's position vis a vis the rest of the economy will depend on both a set of direct and indirect policies and on market forces.

In this paper we shall concentrate principally on the use of market or indirect economic policies in the context of a "mixed" or market economy in which independent producers operate in the natural resources sector, the reason being that such a context has been more common in LDCs, and Chile's experience with indirect policies is more illuminating.

Government policies affecting the position of the natural resources export sector relative to the rest of the economy include differentiated production or export taxes, tariffs or other restrictions on imports, and exchange rates. Those are normally the instruments through which governments affect the relative market rate of return on investment in different sectors. Specific export subsidies on manufactures have also become popular recently as a means to diversify exports or reduce dependence from exports of one or a few raw materials.

But within the natural resources sector it may also be important to differentiate taxes, subsidies, and tariffs on various products, which implies defining explicit criteria on which to base those differentials. There is often a variety of forms in which natural resources may be produced and exported. Most of the time the tendency has not been to apply differentiated export taxes according to the domestic value added of each product variety or other relevant criteria for the country,⁹ but according to its total value of price. In this

matter there is scope for a substantial increase in natural resource contribution to national development by implementing more adequate policies.¹⁰ Similarly, natural resource export sectors have usually been exempted from tariffs on all their imported inputs. This has also had unfavorable effects on the sector's contribution to national development.

A second strategic issue is whether the natural resources sector should be opened to investment by foreign firms or reserved only for national producers. The former certainly increases a country's dependence on foreign conditions, but that negative factor may be compensated by the foreigner's contribution of technology, markets and/or capital. Two additional aspects must be considered in this respect: i) a sector controlled by foreign firms will normally tend to operate large units with highly capital-intensive technologies, compared with the smaller and more labor-intensive domestic firms; and ii) subsidiaries of large transnational corporations with worldwide investments, and often diversified along product lines, behave differently from domestic firms facing the same host country policies. Hence, ownership structures must be considered carefully in order to design optimal policies.

Finally, a third strategic issue in natural resources development is the organization of the public sector to deal with it. Generally speaking, three levels may be distinguished. First, there are decisions which are of such importance and impact on national economic activity -- of a macroeconomic nature -- that they should be adopted in a centralized form. These include investment decisions and programs to expand production, technological development and marketing (especially of strategic products or those in which the country enjoys monopoly power).¹¹ At a second level, specific economic policies should be designed for the sector; e.g. exchange-rate policy for returned values, profit taxes, tariffs on imported capital goods and inputs, output taxes and others. The third level is related to the degree of autonomy to be assigned to enterprises in order to carry out their productive operations efficiently.

In the case of domestic enterprises, either private or public, the first two levels provide the framework within which the maximization of the firm's profits (or the minimization of costs) enables a greater contribution to development, at the same time providing the appropriate quota of financial resources to the government's treasury and of purchases from the national industries. In the case of foreign enterprises, an additional control -- such as borrowing from the domestic economy or from abroad-- may be crucial in order to maximize their contribution to development. As Ffrench-Davis (1974a, p. 48) has stated however: "It is not enough, to define a policy, enact a decree or make a law about those matters. Too many times laws passed or policy definitions have fallen through for lack of will, knowledge or organization on the part of Government officials to persevere in following their implementation." This requires, among other basic things, development of a system of information and collection of appropriate statistics on which to base key decisions.

The following sections will concentrate mainly on the experience of Chile with government policies towards its main natural resources sector: copper. Emphasis will be placed, however, on sectoral policies and ownership, rather than on the role of the sector vis a vis the rest of the economy and on macroeconomic policies about investment of surpluses in the economy as a whole.

2. Copper in Chile: 1950-1975

The copper mining sector in Chile is not homogeneous. It has an internally dualistic structure, in the same way that many less developed countries as a whole have dual economies. On the one hand, there is what in Chile is called the large-scale copper mining (LCM) sector, formed by four firms that exploit the nation's largest ore deposits. Those are the firms formerly owned by Anaconda (that exploited the Chuquicamata and El Salvador mines) and Kennecott (that exploited the El Teniente Mine). Today, all those firms, plus a former medium-size company (Sociedad Minera Andina), are divisions of the

State-owned corporation CODELCO-CHILE. The LCM sector produces an average of about 80 percent of Chilean copper output, but since it is much less labor-intensive than the rest of the copper mining sector it employs only about 60 percent of the workers engaged in copper mining.

On the other hand, there is the small- and medium-scale copper mining (SMCM) sector, which is internally very heterogeneous. About half of the sector's output is produced by five medium-size firms, most of which were owned by foreign investors. All except one of these also were nationalized between 1971 and 1973. The rest of the SMCM sector's output is produced by a large number of small independent miners, almost all of them selling their minerals to a State enterprise that owns several smelter plants and two refineries. This enterprise is the Empresa Nacional de Minería (ENAMI) which also markets most of the copper produced by small scale mining. The SMCM mining sector as a whole has increased significantly its share of total Chilean copper production -- from about 10 percent in the late 50s to over 20 percent in the late 60s and about 16 percent in the mid-70s (see Table 1).

The analysis in this section concentrates mainly on the LCM sector, but something should be said about the SMCM sector because it has been excessively disregarded in the natural resources literature, both in Chile and elsewhere. The importance of the latter in terms of production has been variable, since output appears to be more responsive to price variations. The price boom during the 60s seemed to be one of the main explanations of the SMCM output increase during that period, which has receded after the price fall during the 70s. The SMCM sector, however, generates much less government revenue per pound of copper produced than the LCM sector. Rents and profits are lower as a consequence of less efficiency in production and the exploitation of lower grade ores, except in the case of a few relatively large firms. Finally, the SMCM sector generates proportionally more employment than the LCM sector, but wage rates are lower.¹²

The Copper Sector in the Domestic Economy¹³

Chile is not a country particularly rich in natural resources in

general, except for copper. It has approximately one third of the world's known reserves, although during the last two decades the country has produced only about 12 percent of world output.¹⁴ Copper's importance for the domestic economy far exceeds its relatively small share in GNP (about 10 percent during the period under study) and in total employment (less than 2 percent).

The copper mining sector has a dominant place in the Chilean economy for several other reasons. First, it constitutes the largest individual item in national product in exports (and in private capital services in the balance of payments until the nationalization). In the second place, copper has been the center of foreign investment and control in the Chilean economy. In the third place, even before nationalization (between 1952 and 1970) copper generated about one fourth of tax revenues, and in several years it was the single most important source of fiscal revenues. Finally, copper mining has been the main source of economic instability in the country.

The relative importance of large-scale copper mining in GDP shows no definitive trend between 1952 and 1971, but it does exhibit notorious instability, mainly stemming from price fluctuations. In this sense, at least, the exploitation of its rich copper sources has also caused difficulties for Chile. This is not something unavoidable (i.e., a consequence only of the characteristics of this natural resource), but has been to a large extent the result of the shortcomings of Chile's copper and development policies.

During the two decades before nationalization (1952-71), copper exports represented an average of 70 percent of total exports, but deviations from that average have been substantial due to price fluctuation. By the middle of the current decade that fraction had fallen as a consequence of the low copper prices of 1975 and 1976 and the recent expansion of non-traditional exports.

Capital services -- foreign profits and depreciation -- in the LCM sector amounted to approximately 2 percent of GDP. In other words, they created a difference of two percent between the gross domestic product and the gross national product. Foreign capital remittances

represented between 6 and 18 percent of Chile's total exports. On average, one-fifth of the value of LCM exports remained abroad in the form of profits and capital depreciation.¹⁵

Capital services fluctuations have been much more intense than those of exports, because year-by-year changes in capital services are proportionally more directly linked to copper prices. But, in addition government policy changes have also modified that value on several occasions.¹⁶

Taxes levied on large-scale copper mining have constituted a sizable item in the fiscal budget, but they have also been a source of instability in year-to-year fiscal revenue. Direct taxes on the LCM sector represented an average of 23 percent of fiscal revenues before nationalization (1952-70), and fluctuated between a minimum of 12.5 percent and a maximum of 48 percent of total tax revenue. As a consequence of nationalization (in 1971) that share should probably end up increasing in the long run, although complete statistics are not available. In 1976, for instance, the LCM sector contributed 23 percent of fiscal revenues, although the real price of copper was approximately two thirds of the average obtained in the 1952-70 period.

Fluctuations in copper tax revenues have also been substantial as a consequence of both changes in copper prices and in government policies. There is no clear overall trend during the period in the share of copper taxes on total fiscal revenues, but there are several short-run changes that will be analyzed later.

Production, Markets and Prices

In 1976 Chile produced about one million tons of copper. This is the country's all-time production record, and amounted to about 13 percent of world output. Since the end of the Second World War, however, Chile's share in world output had been falling due to low expansion of production. In the period 1945-70 foreign enterprises in the LCM sector increased output at a rate of only 2 percent per year compared to a 4 percent annual increase in world production. The SMCM sector, however, expanded significantly all during that quarter century (at a rate of almost 17 percent per year), compensating somewhat

for the fall in the LCM sector. By the late 60s, the Chilean share in world copper mining output had fallen from about 20 percent in 1944-46 to 11 percent in 1968-70. But during the 70s, production was expanded considerably, especially in the LCM sector (see Cols. (2) to (4) in Table 1).

The output of the LCM sector comprises three varieties of copper: electrolytic, fire-refined and blister.¹⁷ Although these three types are practically pure with more than 99 percent of copper content, there are notorious price differentials among them because of their different uses and costs. Electrolytic is the purest form of copper.

The structure of production shows significant changes during the last two and a half decades. In the 50s, the output of fire-refined copper dropped drastically and production of electrolytic copper was maintained, while blister production absorbed the fall of fire-refined copper and captured all the expansion of total output. During the following decade, however, expansion was concentrated in electrolytic copper, as a result of the enlargement of refining capacity in Chuquibambilla. In addition, part of the output of blister began to be refined in Chile at the Ventanas Refinery, owned by the State Mining Enterprise (ENAMI), which went into production in 1966, and which also refines copper from the SMCM sector.

With regard to export markets, a notable change appeared after 1954. A significant proportion was diverted from the United States -- the predominant destination until then -- to Western Europe. During the 1960s various other markets were opened, such as the Japanese, although on a small scale.¹⁸ By the end of that decade a quarter of LCM exports were sold outside the United States and Western Europe, and this distribution has been maintained until the mid-70s.

Sales for the domestic market have amounted to less than 2 percent of total output. An additional one percent, on the average, is bought by some copper manufacturing firms located in Chile for exports in the form of wire rod, profile, tubes and alloys. These exports, however, do not have a high domestic value added, and have at times been a

disguised form of reaping the differential between the domestic copper price and that in some particular foreign market.

There is no single or unified world copper market. There are two main markets: the US Producer's (USP) market and the London Metal Exchange (LME). Both are linked -- mainly through US exports and imports -- but not very closely. The latter is much more unstable than the former.¹⁹ Until 1965 Chile sold most of its output at the USP price. In 1966 the Government decided to shift the LCM sales to the LME price or, more precisely, to quote its sale at the LME price.

Table 1 shows the evolution of copper prices in the period 1952-76 and their wide instability. During the period 1952-70 the real price received by LCM exports (i.e., deflated by an index of Chile's external prices) suffered an average year-by-year absolute variation (independent from its sign) of 12 percent. Between 1971 and 1975 -- a period of great instability in the world economy -- those variations increased to an average of 17 percent. Yearly averages, however, underestimate the intensity of fluctuations since they were also large within each year.

After elimination of the effects of world inflation, an increasing trend may be observed in the real price of copper throughout the 60s which was interrupted at the beginning of this decade. Column (7) contains a series of copper's "long-run" price, after the elimination of both world inflation and short-term fluctuations.²⁰ This estimate shows an upward trend until 1956, a downward trend until 1960, then a strong positive trend again throughout the last decade and a systematic downward trend during the 70s.

A comparison of Chile's effective annual (short-run) export price and the "normal" (long-run) price in the world market (Columns (6) and (7) in Table 1) gives an indication of the incidence of short-term fluctuations on the fiscal budget and on the balance of payments. During the last five years, the annual differential between the two averaged 14 cents, or 17 percent of the average long-run price.

These data enhance the importance of action aimed at reducing the instability of the international copper market and also at designing

improved foreign trade and fiscal policies so that the fluctuations in prices, which may continue to exist in the future, do not spread towards the domestic economy.

Cost Structure and Rates of Return on Capital

During the 1952-70 period (before nationalization) the average nominal cost of production per pound of copper for the LCM sector was about 43 cents (at 1976 prices). Before-tax profits amounted to approximately 42 cents. Direct and indirect taxes plus dividends on government shares represented an average of about 30 cents per pound, so after-tax profits amounted to a little over 12 cents.²¹

Costs per pound increased very slowly from the early 50s until the mid 60s. Since 1965 they started increasing relatively fast, especially during the 1970-73 period, but there are no reliable figures available because costs are distorted by the exchange rates used. CODELCO information indicates that operating costs were reduced substantially, and this seems to be the case indeed.²² According to CODELCO's balance sheets corresponding to 1976, production costs in Chile's largest mines did not exceed 45 cents per pound, approximately the same as the average for the whole 1960 decade.²³

The various components of production cost have changed considerably during the last 25 years. Even before nationalization there was a general trend towards greater expenditures in Chile, both in domestic inputs and in labor. Imported inputs as a share in total costs declined from about 20 percent in 1952 to 10 percent in 1970. Depreciation costs increased substantially from 1952 to 1966 because firms were granted accelerated depreciation schemes; since 1967 they started to fall.²⁴

Disbursements in local currency to pay for domestic inputs and labor have represented between a third and a half of total costs.²⁵ Costs paid in dollars include not only imported inputs, but also: (a) marketing, freight and refining costs abroad (which represented about 10 percent of total costs in 1970); (b) depreciation costs, which were dollars not returned to Chile by the foreign firms;

(c) other expenditures in the country, such as some salaries paid in dollars to executives and supervisors and, as of 1966, payments to ENAMI for refining services; and (d) interest on foreign loans (which were very small until "Chileanization" in 1967).

The rate of profit on capital for the foreign firms in the LCM sector (net profits divided by book value of capital) averaged almost 20 percent between 1952 and 1970.²⁶ That rate was highly unstable but always positive: it fluctuated (from a minimum of 7.4 percent in 1953 to 33.4 percent in 1956) as a consequence of changes in both copper prices and government policies. There were only five years with profit rates under 12 percent, all of them before 1965, and five years with profit rates over 28 percent, three of them in the years 1967 to 1969.

3. Chile's Experience with its Copper Policies

There are three basic lessons derived from the Chilean experience with the exploitation of its main natural resource. First, the gains obtained from raw materials exploited by multinational corporations (MNCs) can be substantially altered -- in favor of or against the host country -- by appropriate domestic policies. This occurs notwithstanding that those corporations are large vertically and horizontally integrated conglomerates which maximize world-wide interests and not necessarily only profits. Second, well planned and gradual policies can increase the country's control over natural resources and achieve complete nationalization of the firms exploiting them without the transition costs usually associated with that action. Moreover, if such policies are followed during a reasonable period of time -- in which domestic personnel learn how to run key aspects of natural resources' exploitation -- there is a high probability that the country can become as efficient as the multinationals in producing and selling copper. Third, a nationally operated natural resource sector requires an important reorganization of the public sector to deal with that activity. Public control and discipline must be reinforced to avoid such new problems as a negative tendency towards independence of the

sector from the rest of the economy, and labor pressures that seek to capture for themselves a large part of the increased surplus resulting from nationalization.

Policies Towards Multinational Corporations

The key issue in a framework in which natural resources are exploited by MNCs is to design policies that will maximize the present value of the surplus obtained by host countries in the long run. There is an unavoidable conflict, however, between the fraction of total surpluses captured by the host country that owns the mineral deposits and the level of production that determines the total value of those surpluses. A higher fraction for the host country -- after some point -- implies that net profits for the MNCs become so low that investment and production in the long run is reduced. But, on the other hand, below that optimal point the host country may not gain more from a higher production level if it earns a smaller fraction of the gains from production, as the Chilean experience with the "New Deal" copper policy after 1955 shows.

(a) Ownership policies

Three phases can be distinguished in the ownership structure of the Chilean copper sector during this century. The first goes from the 1920s to 1966, in which production was dominated by three subsidiaries of two large US corporations: Kennecott and Anaconda. The second goes from 1967 to 1971 in which joint ventures were established between those subsidiaries and the State. The third phase, from 1971 to present, is characterized by the exclusive operation of public-owned enterprises in the LCM sector.²⁷

During the first phase, however, the State acquired an increasing -- but not necessarily continuously increasing -- control over the LCM sector. During the first sub-phase, until 1955, income tax rates went up steadily but the main surplus extraction mechanism was by fixing an undervalued exchange rate on foreign currency used to pay for local expenditures and an implicit overprice tax (i.e., a surtax on copper sales above a base price). These policies increased the share of

returned value as a percentage of the total value of production from an average of approximately 50 percent in the 30s and 40s to 92 percent in 1952-54.²⁸ The absolute value of returns to Chile also increased, but net investment decreased and output fell from a record of 475 thousand tons during the war (1944), to 374 thousand tons in 1951 and 323 thousand tons in 1954. The Chilean share in world production fell from almost 20 percent in 1944 to 13 percent in 1954.²⁹

The government's reaction in those circumstances was to offer substantial new concessions to foreign enterprises. This inaugurated the second sub-phase in this period known as that of the "New Deal" (Nuevo Trato). The surtax and the special exchange control were abolished and the variety of income taxes was replaced by a much lower basic tax of 50 percent and a variable surcharge of zero to 25 percent that decreased as output increased in excess of a "basic production level."³⁰ The aim of that mechanism was to provide incentives for investment and output.

The negotiated basic production level, however, represented a sizeable underestimation of installed capacity. Hence, with no extra investment, the firms were able to produce 20 percent more than the basic level.

Accelerated depreciation of up to 20 percent per year was granted to new companies under the Nuevo Trato Laws. Thus, although gross investment increased from an average of 30 million dollars a year between 1952 and 1955 to 64 million dollars in the period 1956-60, amortization increased so much (from 20 to 44 million dollars) that average net investment increased only from 19 to 20 million dollars.³¹

Expansion of production capacity was modest. Output in 1960 reached an apparently high level compared to the all-time low production of 1955 (see col. (3) in Table 1), but was less than one percent above production in 1943-44. Government revenues, however, fell from an average of 288 million dollars per year in 1952-54 to 240 million in 1955-60, while company profits soared from 56 to 120 million dollars per year between those two periods.³²

Hence, additional investment was ultimately financed by sacrifice of government revenues, while the companies were reaping most of the benefits. It was not surprising then, that after a short time the Chilean government, and especially the Congress and general public opinion, became highly frustrated with the companies' reaction to the New Deal policy. Negotiations were opened in 1960 to modify the previous agreement, but they broke down in 1961, and additional income surtaxes were imposed that year as a substitute.³³

No new initiatives could be started until the election of the Frei Government in 1964. Frei's copper policy contemplated two main elements: the formation of joint ventures between the foreign companies and the State (the "Chileanization" of copper) and an investment program that would almost double production in a five-year period. Intense political controversies delayed the implementation of that policy until 1967.

The companies had retreated from their positions of the early 60s and Kennecott offered 51 percent of the shares of its subsidiary (Braden Copper Co.) for some US \$80 million, thus forming the Sociedad Minera El Teniente. Anaconda offered to form a new joint company, Exótica, with 25 percent State participation, but refused to sell part of its shares in the subsidiary exploiting Chuquibambilla. A similar agreement was reached with the Cerro Corporation to form the new Sociedad Minera Andina (a medium-size venture).

A new tax system was established with Chileanization. The income tax rate for Sociedad Minera El Teniente was drastically reduced: a 44 percent duty replaced the basic 50-percent rate, the surtax of the "New Deal" Law, and the two surcharges established in 1961. The tax concessions granted were so considerable that prior to the increase of production deriving from the expansion program, and with a price of only 29 cents per pound (about 60 cents at 1976 purchasing power), Kennecott's 49 percent share of profits exceeded its earnings when it possessed the entire capital.³⁴ It is interesting to note that the tax rate on profits was appreciably lower than that affecting corporations in the United States, so ultimately Kennecott had to pay taxes on that

difference in the US. Thus the Chilean Government essentially granted a free transfer to the US Treasury. The tax situation of the two subsidiaries of Anaconda underwent no significant change; in the case of Anaconda's subsidiary exploiting Chuquicamata there was a slight tax reduction, and in the case of that exploiting El Salvador, there was some increase, due to a tightening of accelerated depreciation clauses.

As Ffrench-Davis (1974a, p. 40) has summarized this experience: "When this negotiation took place, a phenomenon of a nature similar to that of 1955 appeared, but this time it was more intensive and longer-lasting. There was again an increase in copper prices. The combination of tax reductions and the large excess of the real copper price over that assumed by Chilean negotiators meant that the annual earnings obtained in Chile by Anaconda and Kennecott more than doubled their 1965 level. Thus, the same errors were being repeated, despite the experience of the ten previous years and the distinctively more favorable conditions for Chile's negotiating position."

The excessive profits obtained by Anaconda and Kennecott gave a new impulse to public opinion in favor of nationalization. Negotiations were opened in May 1969 and an "Agreed Nationalization" was reached in July. The Chilean State acquired 51 percent of Anaconda's subsidiaries for US \$197 million (51 percent of the book value of their capital) payable in 12 years with 24 semi-annual promisory notes carrying a 6-percent interest. The first payment was made on January 1, 1970. In addition, Anaconda was compelled to provide the option to sell its remaining capital in its Chilean subsidiaries after 1972.³⁵ Finally, an overprice tax was imposed, with the excess above a base price of 40 cents per pound (about 80 cents in 1976 dollars) retained partially by the State on a sliding scale that reached 70 percent of the overprice above 60 cents (120 cents in 1976 dollars).

The period 1968-71 was one of very high prices. Therefore, the government obtained a record level of surpluses: in 1969 it obtained a record \$353 million (\$711 million in 1976 dollars) from the LCM sector (see col. (8) in Table 1). A share of 76 and 81 percent of before-tax

profits went to the State as dividends or taxes in 1969 and 1970, and still the rate of return on the foreign companies' capital reached 31 and 26 percent.

Production, however, still remained almost constant at around 525 million tons a year. The investment programs were delayed and there was a general sense of frustration in Chile with the way the foreign copper companies had behaved.

Thus, during the Presidential Election of 1970 two of the candidates -- who obtained almost two thirds of the votes -- included complete nationalization in their platforms. Only a little over a month after taking office, President Allende sent a Nationalization Bill to Congress. It was supported by all political parties in the country and was approved in July 1971. This inaugurated the third phase in the Chilean copper history: that of a nationally (State) owned LCM sector.

(b) A brief analysis of surplus extraction policies

Traditionally Chile used three main devices to extract surpluses from the large-scale copper sector, sometimes in an implicit form. The first, and generally the most important, was taxation of profits.³⁶ The second policy was either an explicit overprice tax, or an implicit tax resulting from the purchase of copper by the State at a given price and its sale at a higher one. The third mechanism to extract revenues from the LCM sector consisted of imposing a special exchange rate artificially undervalued,³⁷ forcing the companies to return a larger fraction of their foreign exchange earnings to the country in order to pay their expenses in national currency (especially national inputs and labor).³⁸

The Chilean experience shows that the latter policy was much less efficient than the former two as means of increasing the country's gain from natural resources, because it had negative effects on costs of production and their composition, as well as on output.

Available studies show that the discriminatory exchange policy by itself did not bring about an increase in government revenue from the large-scale copper sector in the long run.³⁹ The main reason was that

technical substitution between imported and national inputs in copper production was high. Hence, the fall in the relative price of imported inputs, as a consequence of a fall in the real exchange rate, generated an increase in the use of imported inputs that replaced those of domestic origin. Although the dollar expenditures needed by the companies to pay each peso of domestic costs may have been greater with a lower exchange rate, the total costs in pesos -- and consequently foreign exchange returning to the country on that account -- was only slightly greater. Moreover, the higher total costs implied lower profits and, therefore, smaller government tax revenues and production. In the final analysis total foreign exchange income for the country did not increase as a result of only using the exchange rate as an instrument to increase Chile's share of copper revenues.⁴⁰

Income and overprice taxes were much more successful. They pointed more directly to extracting the true economic rent from ore deposits that belonged to the country, while maintaining a predetermined minimum rate of return on capital for the companies.

It is true that effective income tax rates on the LCM sector in Chile were high, but company profits have also been high. In the period 1955-70 income taxes averaged approximately 56 percent of the before-tax profits of foreign firms. Income tax rates in Chile were higher than in other countries of the world,⁴¹ but Chilean mines are considerably richer too,⁴² a fact reflected in the volume of net profit earned by the corporations. Recall that the companies' rate of return on capital averaged almost 20 percent during that period.

The experience with an explicit overprice tax since 1969 was also very successful. Government revenues increased considerably without a fall in production, while the companies' rate of return fell but still remained above a minimum level that would have even made reinvestments attractive. The 1953-54 experience with the implicit tax resulting from the direct sale of copper by Chile was not successful due to the lack of knowledge and organization needed at that time to sell copper in world markets.

Finally, a word must be said about the stability of surplus extracting policies. Discouragement of new investment and only small

increases in production may have been much less the consequence of the country's policies per se as of their instability. Too low taxes, or high tax concessions -- which imply a relative loss to the country -- will not spur production if the companies do not expect them to remain low. Too favorable or unfavorable policies towards foreign companies are intrinsically unstable; and unstable policies neither stimulate investment in the host country nor bring about a higher surplus from the exploitation of natural resources.

Domestic Control of MNCs in Natural Resources

Some control or supervision over production and exports of natural resources is not only a matter of national pride, but of necessity in order to secure an economic gain for the country that possesses them. Natural resources earn rents which are not normally fixed in perfectly competitive markets. In addition, there are many ways in which companies may take these rents out of the countries in disguised forms. The country that owns natural resources must seek the means to share part of those rents and use them for its development purposes.

The key aspects that a country should try to control vary for different natural resources. The Chilean experience with copper shows that, aside from accounting control, imports and marketing were critical aspects. In addition, a specialized government agency was needed, which could also serve as a technical staff for the negotiation with foreign investors.

Until 1955 control of the operation of the LCM sector was exercised by the Central Bank. The experience with the application of special exchange rate policies and with the independent marketing of copper in the early fifties taught the need for trained personnel to handle those issues.

Probably the main positive aspect of the "Nuevo Trato" law of 1955 was the formation of the "Departamento del Cobre," the forerunner of CODELCO. Its principal task at that time was to promote the integration of the LCM sector with the rest of the economy, mainly through the

substitution of domestic for foreign inputs. As a consequence of its direct action and better foreign exchange policies, domestic inputs, as a fraction of the total, increased from 40 percent in 1955-57 to 72 percent in 1970-71.⁴³ Thus, dependence on foreign sources of supply was reduced. In addition, the first systematic statistics about costs, profits, production, stocks, prices, etc. were collected.

The Frei administration that took office at the end of 1964 granted more power to the Departamento del Cobre which started controlling sales operations and diversifying markets. In 1966, it decided that Chile would start selling at LME prices rather than the much lower US producers' prices. By the late 60s, CODELCO had a marketing division with top level personnel who had acquired the expertise to sell copper in world markets as efficiently as the sales agencies of Kennecott and Anaconda.

Finally, the knowledge of the Chilean LCM sector and the world copper industry accumulated in CODELCO, in specialized divisions at the Central Bank and in the Ministry of Mines, was paramount for the success of the negotiations that led to the "Agreed Nationalization" of 1969 and to complete nationalization in 1971.

The Challenge of Nationalization

On the whole, the Chilean experience with nationalization has been clearly positive. The common fears that the country and the State would not administer the LCM sector efficiently did not prove real. The latter was to a large extent the consequence of having followed a gradual policy of increasing State control over the sector, of training local personnel and building up the appropriate administrative agencies.

The expropriation procedure had some shortcomings that could have been avoided and from which all less developed countries could learn. The Nationalization Law -- which, on the whole, responded to the accepted norms of "International Law" -- had two presumably questionable clauses which proved to be very important.

First, The Nationalization Law restricted the competence of the Chilean judiciary system to rule on some appeals by the companies.

This opened up the possibility for the companies to appeal before foreign courts to the currently most accepted "International Law."⁴⁴ This was the argument used by Kennecott before some European courts which resulted in the embargo of some copper shipments.

Second, the Nationalization Law simply suspended payment of the promisory notes that had been issued by the Chilean Government in 1969 for the payment of 51 percent of the shares of Anaconda's subsidiaries. Anaconda went to court and obtained another embargo of CODELCO properties in the US. These actions did not have any important consequences on the copper sector as such, but were matters of concern for the Chilean Government as a whole.

CODELCO, which took over the administration of the nationalized firms, did not have much trouble in maintaining the levels of production reached in the past and in finishing the expansion program. There was a delay in the latter, presumably due to some major technical errors in the original plans and the lack of interest on the part of the foreign companies because they had expected nationalization since the late 60s. The expansion of capacity was finally completed by 1973.

There were no major technical difficulties with the operation of the mines. Foreign executives and technicians were not very important in the LCM sector before nationalization. But many Chileans left the country to work in other Anaconda and Kennecott subsidiaries,⁴⁵ a trend abetted by an ill-defined policy of implicitly reducing the salaries of supervisors and technical personnel at that time.

Paradoxically, the worst problem faced after nationalization related to labor relations. This occurred notwithstanding the fact that labor unions had traditionally supported the leftist coalition that controlled the government between 1970 and 1973. They were presumably conscious also of the importance of copper revenues for the transformation program intended by President Allende and the adverse external conditions faced.

Absenteeism increased 42 percent in Chuquicamata in the second half of 1971 (the firm had been nationalized in July) compared to the first half. Partial work stoppages in different divisions still

remained high. There were 37 in 1971, down from 80 in 1970, but they increased sharply again in 1972 and 1973. In El Teniente there was a 3-month-long strike in 1973 with serious economic and political consequences.⁴⁶

Labor unrest was partially a result of the overall political situation in the country during 1971-73. But the situation was worsened by improvised labor relation policies within the sector, the appointment or promotion of personnel based more on their political affiliation than technical competence, and lines of authority weakened or distorted by political loyalties.

The importance of labor discipline became apparent when the military took over the government and controlled the mines on September 11, 1973. Within a few months, production increased substantially; output in 1974 was 24 percent greater than in 1973 and in 1976 it reached a record of 850 million tons in the LCM sector alone.⁴⁷ To the extent, however, that labor discipline has been lately obtained through limitations of workers' rights, there is no guarantee that the problem has been adequately solved in the long run.

With respect to the organization of the public sector to administer the State-owned LCM sector, it appears that on the whole an appropriate combination of centralization and decentralization has been reached. At the beginning there was an excessive tendency towards the former, but it did not reach a high level of bureaucratization. Recently, however, the tendency to decentralize may have gone too far with respect to marketing. A country that has some oligopolistic power in an imperfect market, such as copper, should try to centralize all sales, especially to negotiate in world forums for the stabilization of prices.⁴⁸

The results of nationalization can be summarized in gross terms by the comparison of a single figure.⁴⁹ Fiscal revenues and profits for Chile in 1976, with an effective copper price of only 67 cents per pound, reached about 500 million dollars. This exceeds by at least 60 percent the average government income obtained in the fifteen years before nationalization (1956-70), although the real price of copper

was much lower during the latter period: In 1976 dollars prices averaged 82 cents during 1956-70.⁵⁰ The average annual fiscal revenue for the period 1956-70 was only US \$312 million dollars at 1976 purchasing power. Correcting further for the difference in the price of copper, the payment for the capital expropriated from foreign companies and changing production levels, the net copper revenue for Chile in 1976 per pound of copper produced was twice that obtained in the period 1956-70.⁵¹ Provisional estimates show that the net surplus obtained from the LCM sector amounted to about 25 cents per pound, compared to less than 12 cents that could have been obtained in the period 1956-70 with a price as low as that of 1976. In other words, if copper had not been nationalized, Chile would probably have received about US \$200 million less in fiscal revenues from the LCM sector in 1976 with the low real prices of that year.

4. Natural Resources and Development

There are several questions one would like to answer with respect to the relation between a country's exploitation of natural resources and its overall development. Two of the most relevant ones are dealt with here. First, how much could and should development of small LDCs be based on natural resource exploitation? Second, what are the basic conditions that must be satisfied in order to secure the maximum contribution of natural resources to a country's development?⁵²

In the case of Chile, technically speaking, copper could have contributed and can contribute more to economic growth. Chile possesses the richest and most economic ore deposits known today in the world: they represent over 30 percent of world copper reserves. Notwithstanding, the country produces only about 13 percent of total copper output. Chilean output has increased less than in the rest of the world during the last quarter century, so its share in world production has fallen. Thus, technically, there are no impediments for Chile even to double its production in a reasonable period of time -- say, 8 to 12 years.

From a world-wide perspective, there is under-exploitation of Chile's main natural resource; there is an inefficient international allocation of the world's factors of production used in copper production. Therefore, a decision by Chile to move towards an "open economy" with free trade and free capital movements -- under normal conditions -- implies that market forces would very probably lead to a significantly greater specialization in copper production. A very important question from a social national point of view, however, is whether a country like Chile should become specialized in exporting natural resources. Since in practice a free-market policy is the one being followed by the present Chilean government, the previous question is not a hypothetical or trivial issue, but a very relevant one.

Trade liberalization will clearly result in more exports by all sectors. But, in addition, we are suggesting that it will imply more specialization in copper. Although exports of other (non-traditional or other mineral) sectors may also increase rapidly, especially in the short run, there are indications that copper exports would increase faster. Space limitations preclude discussing the indicators that support this hypothesis,⁵³ and complete studies on the subject have not been made. But aside from the technical considerations discussed previously, the LCM copper sector appears to be one of the relatively more profitable activities within the Chilean economy. CODELCO -- the enterprise which operates the mines in that sector -- had a rate of after tax profits on its capital of about 26 percent in 1976, which was a year of exceptionally low prices. If CODELCO's profitability is estimated at a more normal price -- for instance, the average price during the last 20 years -- that rate increases to over 40 percent. It is hard to find other exporting sectors -- even based on natural resources like forestry, paper pulp, fruit or wine -- which may have such a high rate of return in the long run.

Also if foreign direct investment is to enter massively into Chile, it is most likely to go into copper production. If investment has not materialized yet, it is not mainly because of economic inconveniences, but because the country's political climate is not

attractive and its long run stability is not guaranteed.

The convenience of specialization in copper under *laissez-faire* conditions from Chile's national point of view is not at all clear. The main reasons are that a large expansion of copper relative to other sectors would: (a) worsen or at least postpone the solution of the important unemployment problem suffered by Chile; (b) increase the country's external dependence; (c) significantly raise the country's economic instability; and (d) in general, probably weaken to some extent the impulse towards an integrated national development effort whose benefits will be the result of the sacrifices and support of all Chileans. Certainly these global factors should be considered in addition to a careful evaluation of the purely economic convenience of copper output expansion.

The former considerations do not imply that copper mining should not be expanded at a faster rate than in the past, but that it should be done in an efficiently planned or regulated form, rather than in a *laissez-faire* framework. The former means that expansion should be carried out within a policy framework that corrects the price distortions usually existing in less developed countries and that takes into consideration the "externalities" generated by that expansion, or should be carried out directly by the public sector.

The copper sector is relatively very capital-intensive, and Chile is very labor-abundant with a serious unemployment problem. With the present productive structure, a doubling of copper output would not generate more than about 3 percent additional direct and indirect employment opportunities, with copper exports representing around 20 percent of GNP.⁵⁴ Capital investment requirements would be huge -- on the order of 4.5 to 6 billion dollars -- suggesting the possibility of depending again on foreign capital. In addition, the backward and forward linkages of copper mining are relatively minor.⁵⁵ It would not stimulate the rest of the economy considerably through purchases of domestic inputs or help to expand automatically the copper manufacturing industries.

Again, the answer in these circumstances is not simply to avoid expanding copper production. One could choose, however, whether to expand as in the past (and to concentrate only in extracting economic surpluses from the LCM sector in order to have funds to invest in other more labor-intensive sectors), or to take into consideration the different factor intensity of production within the copper sector, and expand more those varieties of copper that are relatively more labor-intensive and have more forward and backward linkages. There are indications that in a country such as Chile both criteria should be considered: not only should the copper sector be expanded to extract a sufficient surplus, but also all the country's resources should be used in a socially efficient form. But more research is needed on this issue.

Excessive emphasis seems to have been placed on producing as much refined copper as possible.⁵⁶ But refining is much more capital-intensive than mining while value added by that process is not as great. Chile has a clear comparative advantage in the latter, while it costs approximately the same to refine a ton of copper concentrate (which has about a 30-percent copper content) in Chile as in Japan or almost anywhere else. Today, both the "pure" (or Marshallian) as well as the oligopolistic rents on this natural resource are obtained at the mining stage. The refining industry as such is quite competitive at the world level.

Some additional considerations should be made in the design of an appropriate structure of copper expansion. Forward linkages are very important. Chile's development of a copper manufacturing industry has been restricted to some extent by tariffs and quotas imposed by the industrialized importing countries and by multinational companies that operate in the latter. Therefore, Chile could try to use its oligopolistic power in order to negotiate the selling of its additional copper output in the form of concentrates, in exchange for easier access to the market for copper manufactures. Similarly, the access of MNCs to the exploitation of the country's natural resources can be conditioned by reciprocal participation in their manufacturing activities. This is particularly important because the price of copper

manufactures is much more stable than that of refined copper, so this is an efficient way to stabilize the exporting country's revenues.

Probably the most crucial condition that must be satisfied if a country such as Chile were to base its development on copper production is the stabilization of price or the design of means to compensate for the effects of that instability on the rest of the economy.⁵⁷ Instability has a social and political cost for the country, aside from a purely economic cost, which, in addition, is normally higher for society than for individual investors in copper.⁵⁸ Unregulated expansion of production would increase all those costs, because it generates some negative externalities that must be considered.

During the twenty-year period before nationalization the real price of copper (i.e., deflated by the purchasing power of the dollar) each year went up or down an average of 12 percent compared to previous years. Fiscal revenues in the form of profits and taxes -- which represent most of the net surplus obtained by the country from the exploitation of its main natural resource -- fluctuated an average of 28 percent in the same period. These rates have increased in the last 6 years due to the greater instability of world markets. Copper prices fluctuated an average of 17 percent per year between 1971 and 1976.

Since in small countries such as Chile those surpluses finance most new investment, the rate of growth of GNP becomes quite unstable and unpredictable if no compensatory measures are adopted. Copper exports in Chile are equivalent to the capital goods sector in developed countries, because over 75 percent of investment goods are imported.

In addition, export fluctuations have a strong inflationary bias. Balance of payment surpluses tend to expand the money supply and the price level rises. But the downward rigidity of public expenditures and wages does not allow deflationary economic policy in periods of lower copper prices to reduce the price level again.⁵⁹

The export instability problem can be tackled either by stabilizing prices (and/or output) or by compensating the effects of instability on the rest of the domestic economy, or both.⁶⁰

The former is clearly the first best policy, but in the case of a product such as copper there is very little that can be done by an isolated country such as Chile. Producing countries must act together, even forming a cartel if possible. Even the latter may not be enough, however, when instability originates from demand fluctuations. Therefore, consumers must be included in a scheme seeking to stabilize prices.

In copper there is a Council of Copper Exporting Countries (CIPEC), but its monopoly power is significantly smaller than OPEC's (Tironi 1974b, sec. 1; see also the paper by Switucha in these Proceedings). Copper exporting countries do have some oligopolistic power, however, which could be used more effectively for trying to stabilize prices rather than trying to obtain permanent price increases. Up to now, the copper-exporting countries have been excessively passive in accepting the inherited practices of price determination. UNCTAD is now seeking means to reach agreements for price stabilization of raw materials -- with the participation of consumers -- but the difficulties involved are so great that those mechanisms alone can hardly solve the whole problem.⁶¹

Some additional international mechanisms to stabilize revenues from natural resources should be also considered. A very interesting proposal has been put forward by Lessard (1977), using a financial intermediation mechanism based on commodity-linked contracts. But these types of proposals require even more study and negotiation.

At a domestic level three main policies have been suggested in Chile to cope with the impact of export fluctuations on the domestic economy. The first is to diversify exports, expanding more rapidly exports from other sectors such as agricultural commodities, forestry, cellulose and others. But as mentioned, this has a cost in terms of not using fully Chile's considerably greater comparative advantage in copper production.

The second policy is to have a completely flexible exchange rate determined in the "free market." This is strongly favored by many of today's government policy-makers, who presume that an efficient

futures' market would be created automatically to stabilize the exchange rate. This policy is suggested mainly in order to eliminate the inflationary pressures caused by money supply expansions created by the government's purchases of foreign currency at a fixed exchange rate.

The limitations of such a policy are several and quite obvious. Its three main problems are: (a) The foreign exchange market would still be dominated by the State, which would account for about 60 to 80 percent of foreign exchange supply and demand. (b) A stable futures exchange market requires a stable futures copper market. If the latter has not been developed at a world level by the expert operators in that market in London and New York, there is no reason to expect that Chilean foreign exchange operators would be able to predict (future) copper prices more accurately. (c) Although under a flexible exchange rate system the money supply would not be directly related to copper prices, fiscal revenues would still be tied to them, with similar consequences on the rest of the economy.

In fact, contrary to what is expected by "monetarist" policy-makers, a free exchange rate policy would be the best way to transmit the structural instability of copper export prices to the domestic economy. The effects of such a policy on the productive sector and on development is not so obvious, but has important negative implications. The rate of return on investment in many tradable goods sectors will always depend on unstable exchange rates. How will an investor decide whether to produce an import substituting project with a 5- or 10-year maturity if the exchange rate typically can be expected to vary over at least a 12-percent range every 2 years depending on the price of copper?

The third alternative policy is to accumulate high foreign exchange reserves to cope with export price fluctuations. This is a much more sensible policy for a country facing unstable external prices. But by itself it involves high costs (there are cheaper alternatives) for the country because the amount of revenue that would be needed is considerable. The core of the problem, however, is how to

maintain those reserves or to avoid the temptation of every government to use immediately all the transitory income obtained in periods of high copper prices.

Regulation of the use of copper surpluses, therefore, involves a deep political problem. The economic history of Chile shows that in the great majority of cases in which there has been an increase of prices -- even when obviously temporary -- the additional revenues have been spent rapidly by the government due to the latter's almost permanent fiscal deficits.⁶² Thus, copper income has served to postpone necessary efforts to increase domestic savings or taxes required to finance long-run investment.

The fluctuating nature of copper income calls for the spending of government revenues in the fiscal budget according to the expected long-run copper price. This is easy to say, but hard to implement; the problem is how to enforce politically such a type of government behavior. I want to suggest that a significant step in that direction can be taken by creating a specific institution explicitly responsible for the problem and by setting publicly known and agreed upon guidelines according to which copper revenues should be distributed over time.

The latter propositions require, first, educating policy-makers, public officials, politicians and the general public about the importance of copper revenue instability and of using a "normal" or long-run copper price in development planning. In this sense, the contribution of the Ricardo Ffrench-Davis book (1973) in introducing the latter concept and using it in policy making and in the analysis of Chile's economic policies has been substantial.⁶³

In the second place, an autonomous "Copper Stabilization and Investment Fund" should be established and administered with some independence from the central government and the copper companies. A commission in charge of its management should be elected for sufficiently long periods of time to avoid political interference, similar to the manner in which the heads of Central Banks are chosen in most developed western countries. In nations with a significant natural resources export sector, regulating the use of revenues coming from

those resources is as important as regulating the money supply; in fact, the former determines to a large extent the changes in the latter.⁶⁴ The managers of the Copper Fund should have explicit authority to invest in short-term securities at home and abroad, and to make loans or buy public and private sector bonds.

In the third place, the fiscal sector by itself could also seek compensating taxes to stabilize its revenues. The first-best policy in this context would be to set "variable tariffs" on a small set of imported consumer goods not produced domestically which are inversely related to copper prices. Automobiles are an example of a good that should be included in that set. When copper prices are low, tariffs would increase, thus reducing imports and increasing fiscal revenues to compensate for the fall in copper final revenue. But the higher tariffs should be explicitly temporary and increased discretely within a previously determined optimal range. The maximum rate should be such that it would not encourage domestic production, nor reduce the quantity imported so much as to reduce fiscal revenues from tariffs. When copper prices rise again -- so the country as a whole becomes "richer" -- tariffs can be reduced and citizens may have the chance to buy new durable goods.⁶⁵ The scheme would have to operate with a small set of goods chosen by taking into consideration not only the fact that they should never be produced domestically, but also their impact on income distribution, their demand elasticities and the fiscal revenues that they could generate.⁶⁶

If, instead of the tariff change on a few commodities, the exchange rate were to be allowed to rise or fall as a consequence of a temporary copper price change, that instability would be transmitted to many other sectors in the economy, and many import-substituting or exporting productive activities would absorb or release resources erroneously. The main advantage of the variable-tariff formula is precisely that the exchange rate would not be affected by short-term copper price fluctuations. Thus, the rate of return on investment in other sectors of the economy would not be affected by the latter. Also, since there would be no domestic production of the goods subject

to the "variable compensating tariffs", the pressures from national producers and workers to maintain high tariffs can be avoided.

Capital goods should probably be excluded from the set of variable tariffs precisely to avoid having their prices fluctuating with those of copper. The basic concept is for investment to be independent of short-run phenomena, especially considering the cost of having projects stopped before they are completed due to lack of funds in periods of low copper prices. This has been a situation often faced in Chile, with considerable indirect effects on employment and overall economic activity, but would not be the case with the "non-essential" imported consumer goods suggested in the formula proposed here.

The latter proposition implies a new criteria for determining the whole structure of foreign trade and tariff patterns. Traditional discussions about free trade, zero tariffs or high industrial protection between neo-classical and structuralist economists assume homogeneous economies. We need to imagine new schemes for structurally unbalanced economies.

The problem has become more urgent for countries which have nationalized their natural resources. Now a larger fraction of their income comes from an unstable source, while they have added a fixed expenditure item in their balance of payments (the sum to be paid annually for the foreign capital purchased). Multinational corporations formerly transferred their income instability to their shareholders or reduced that instability through product diversification. Shareholders, in turn, avoided much instability (or risks of fluctuating dividends and capital gains) by diversifying their portfolio of securities. Small country governments cannot resort as easily to those procedures. Therefore, countries accepting foreign investors in their natural resources sector should try to obtain part of their surpluses as a fixed rent to be paid by the companies. In practice they could "lease" their ore deposits, opening auctions for their exploitation, or set a fixed tax sum based on a long run or normal copper price. In these ways, a larger share of instability would be transferred to the foreign investors which have more means to compensate for it. Foreign companies may be able to compensate for the

effects of copper revenue instability at a lower cost than the host country, leaving both better off by using that kind of surplus extraction policy.

The decision concerning which of the above stabilizing mechanisms to choose requires further study. Probably all of them can be used complementarily in some appropriate degree. At this stage, however, one of the most important contributions that can be made in order that LDCs may take advantage of the mixed blessing of possessing rich natural resources, is to propose and analyze policies to cope with the effects of their serious price instability.

FOOTNOTES

¹See Pinto (1973).

²For a modern simple view on the problem see Johnson (1962).

³For a simple general presentation of the arguments by classical economists, see Meier and Baldwin (1961), pp. 78-81.

⁴Nurske (1954).

⁵See especially, Scott and Scitowsky (1970), Bhagwati (1977) and Krueger (1977).

⁶Ffrench-Davis and Pinera (1976).

⁷At a different but related level, a country must decide how to use the revenue or surplus obtained from the exploitation of natural resources. We shall not concentrate on this topic in this section, however, because it is more a matter of overall development policy in a country with rich natural resources.

⁸Of course a country could have a completely laissez-faire market economy which implies the absence of government policies or intervention in favor of or against any particular sector in comparison with the others. In that framework, production and investment in the natural resources sector would be determined only by the market; that is, by presumable independent entrepreneurs comparing private productivities and market prices in different sectors. We do not need to discuss the implications of that type of policy option: practically no LDC that depends heavily on natural resources follows such a laissez-faire policy today.

⁹Such as, for instance, the instability of products' prices or employment generated in their production, whose importance is analyzed below.

¹⁰Notice that the same could be done by directly fixing the adequate targets in the case of a planned economy. The crucial point is determining the social criteria on which to base the production decisions.

¹¹In addition, investments to develop new natural resources in LDCs are usually so large compared to the rest of the economy, so discontinuous in time and involve so many externalities, that they should require direct public evaluation and supervision.

¹²For details about the SMCM sector, see Tironi (1974a).

¹³This section is based on Ffrench-Davis (1974a).

¹⁴Corporación del Cobre (1975), Table XVIII, Annex 1. See also Statistical Appendix Table A-1.

¹⁵Accounting depreciation contains an element of net earnings, due to the system of "accelerated depreciation" which has been applied to this activity. Ffrench-Davis (1974a), p. 33.

¹⁶See Section 3, 1 and 2 below.

¹⁷All statistics about production refer to the copper "content" of output, although it is different for the various forms in which the product may be sold.

¹⁸See Statistical Appendix Table A-2.

¹⁹For an analysis of how the copper market operates see Banks (1974) and Bentjerodt (1974).

²⁰This is Ffrench-Davis' "normal" copper price obtained as a seven year moving average. All the figures are in 1976 dollars which are deflated by an index of Chile's external prices. See Ffrench-Davis (1973), Tables 47 and 27, pages 282 and 238.

²¹Estimated by the author on the basis of data provided by CODELCO (1975, Table 1, page 17) and Ffrench-Davis (1974a, Table 4). The figures about costs are not very reliable because of several heterogeneities in the definition of costs used by the different enterprises. Costs per pound include the implicit exchange rate-tax (which represented an average of about 6 percent of total costs) but excludes an imputed interest rate on the enterprise's own capital.

²²See statements by the Chairman of the Board of CODELCO in El Mercurio, March 26, 1977.

²³Since the price of energy has increased substantially in this period that result implies that costs not related to petroleum must have increased less or even may have fallen in real terms.

²⁴All these data are also from Ffrench-Davis (1974a, Table 4) obtained from CODELCO and the Banco Central de Chile.

²⁵Those disbursements were inflated during some periods due to an implicit exchange-rate tax which resulted from the obligation imposed on the firms to sell their dollars in the Central Bank at an exchange rate (pesos per dollar) lower than that applicable to the rest of foreign trade. That tax was particularly significant in the 1952-55 period. In some of those years it amounted to more than 50 percent of local expenditures.

²⁶ Obviously the rate of profit underestimates the true return on investment for the companies since they enjoyed accelerated depreciation allowances. But there are no indications that, in addition, they transferred profits abroad through transfer pricing.

²⁷ Since 1973 there has been an attempt to attract foreign investors again in order to open new mines. Only as recently as July 1977 the first mixed enterprise was formed between the State and a Canadian firm.

²⁸ Reynolds (1965) col. 81, p. 378.

²⁹ Corporación del Cobre (1975) Annex 1.

³⁰ The basic level was equal to 95 percent of the average annual output registered in the period 1949-53. The initial phase of the period chosen coincided with crisis years in the international copper market; towards the end of this five-year period, world demand was increasing, but Chile had difficulties in selling its production, and this had negative repercussions on the use of the installed capacity of the sector.

³¹ All these figures are expressed in dollars with 1976 purchasing power, and are based on Ffrench-Davis (1974a, Table 6).

³² Ibid, Table 4.

³³ For accounts about the negotiations during this period, see Baklanoff (1965). On the companies' behavior see Girvan (1974).

³⁴ Ffrench-Davis (1974a), p. 29.

³⁵ Corporación del Cobre (1969).

³⁶ Including an income tax on company profits and additional tax on dividends remitted abroad.

³⁷ Recall that in this paper the exchange rate is defined as peso per dollar.

³⁸ A fourth implicit policy followed by some governments was a favorable attitude towards higher wages for workers in the large mines. Their earnings were much higher than those of other workers within the country, but that implied a larger proportion of foreign exchange returned to Chile. Thus, they captured part of the rent generated in copper production.

³⁹ Ffrench-Davis (1974b) and (1975).

⁴⁰The policy of supporting or allowing excessively high wages and salaries in the large-scale mining sector and the concessions that reduced capital costs (such as accelerated depreciation and tariff exemptions) probably had a similar, although smaller effect. It may have discouraged employment by the companies, hence collecting more foreign exchange for the country on that account, but to a lesser extent because the substitution between labor and capital seems to be lower than between imported and domestic inputs.

⁴¹See Mikesell (1970), p. 370.

⁴²The content of pure copper of the Chilean mines is between 1.2 and 1.8 percent compared to one percent at the world level and only 0.3 to 0.5 percent in the United States. See "Open Pit Mining in the Seventies" in Engineering and Mining Journal (quoted by Moran (1971) p. 24-25). The Chilean mines have other advantages too, such as their proximity to ports, which reduces transportation costs considerably. According to recent statements by CODELCO officials, the investment costs of opening a new mine in Chile are approximately half of those in the rest of the world. See El Mercurio, March 26, 1977.

⁴³Ffrench-Davis (1974b), Table 3.

⁴⁴For details see Vargas (1974) and Novoa (1973).

⁴⁵In El Teniente, an average of 16 supervisors left the enterprise per month between September 1970 and June 1971, compared to a rate of 8 per month in normal times. For more details, see Tironi (1972).

⁴⁶It is important to note, however, that workers' attitudes were more positive in some minerals than in others, depending on their political affiliation, on the training they had received and on their particular occupations. For an interesting analysis about workers' behavior see Bitar and Pizarro (1974).

⁴⁷Productivity also increased from about 19 metric tons per worker in 1973 to 27 metric tons in 1976. Back in the late sixties (before nationalization) labor productivity amounted to about 24 tons per worker (ODEPLAN (1977, Table 14) and Ffrench-Davis (1974b, Table 2)).

⁴⁸See Tironi (1974b) sec. 1.

⁴⁹Obviously, a more complete evaluation of nationalization would involve comparing the trends in production, fiscal revenues, etc. before that event with the actual results in the whole period after nationalization. But we are not interested here in a complete evaluation of nationalization.

⁵⁰The surplus that could have been obtained from the LCM sector in 1976 if price had been equal to the average of the previous 20 years (82 cents) would have reached almost 800 million dollars.

⁵¹These estimations assume a payment of 45 million dollars to Anaconda, Kennecott and Cerro in 1976, and all figures were deflated by the index of external prices for Chile, which was 98 percent higher in 1976 than in 1969. Thus, a 60-cent copper price in 1976 is equivalent to about a 30-cent price in 1969 measured in 1969 dollars. The source of data for the 1956-70 period is Ffrench-Davis (1974a) and those for 1976 were obtained from CODELCO's balance sheets (also published in El Mercurio, March 30, 1977).

⁵²An excellent account of other issues on natural resources and development is provided in Garnaut's (1977) paper in this volume.

⁵³The only economic study of that sort is that of Foxley and Clark (1972) which uses a linear programming global model of the Chilean economy. Their results indicate that output expansions on the order of 50 percent would be justified for real copper prices similar to those of the late 60s and early 70s.

⁵⁴It is of great interest to observe that in Foxley and Clark's (1972) model when copper output is increased 45 percent over the 1975 expected level, rather than only 10 percent, the unemployment rate increases from 6.6 percent to 7.2 percent because domestic resources are pulled away from the other more labor-intensive sectors of the economy. Obviously the model contains a restriction of national and foreign savings.

⁵⁵The coefficient of indirect to direct employment opportunities created by copper mining is 0.7 compared to 1.4 in the manufacturing industry (Marfan, 1977).

⁵⁶This may not have been always negative in the past; conditions change depending on refining and transportation costs. But during some periods refining was over-subsidized. For instance, the New Deal Law in 1955 authorized the foreign companies to charge directly as a cost one cent per pound for refining based on additional capacity. Since by that time value added in refining was about 1.2 cents per pound, assuming a 60-percent income tax rate, the Government was granting a 125 percent effective subsidy to refining in Chile. Ffrench-Davis (1974a), p. 39.

⁵⁷Note, however, that this is a valid problem for most LDCs with a high fraction of exports of natural resources. According to a study by Grunwald and Musgrave (1970, Table B-2), 8 out of 15 major primary commodities exported by Latin America had a price fluctuation higher than that of copper in the period between the Second World War and 1964. The literature about problems of export instability is relatively scarce. The classical contributions are those of Wallich (1950

and 1961). Other useful studies are those of Coppock (1962) and MacBean (1966).

⁵⁸This topic is difficult to study but there are non-trivial relations between economic and political instability in Chile. See Tironi (1974c).

⁵⁹These considerations gave rise to a whole theory of inflation in Latin America known as the "structuralist" theory. See especially Sunkel (1960).

⁶⁰For a brief survey of the microeconomic theory of welfare effects of price instability, see Comisión Chilena del Cobre (1977).

⁶¹UNCTAD (1976).

⁶²A notable exception occurred in the period 1966-70, when a large share of the abnormal copper revenue was saved in the form of foreign exchange reserves at the Central Bank. The latter were not spent notwithstanding that there was a very close presidential election in 1970, with the candidate of the governing party losing to President Allende.

⁶³Recall that French-Davis' normal price is defined as a seven year moving average centered in the 4th year, i.e., that includes a prediction of the prices during the next three years.

⁶⁴Chilean exports are three times greater than the domestic money supply and most of the former correspond to one product, while in the U.S., for instance, exports are only one third of the money supply.

⁶⁵Tariff changes should be discrete, although not necessarily with fixed dates at which they would be varied again in order to avoid expectations making those changes ineffective. For instance, the rules could be that if the copper price is below 65 cents per pound, tariffs on cars would be 150 percent; if that price is between 65 and 75 cents, tariffs fall to 100 percent; if the former exceeds 75 cents the latter would fall to 60 percent. The build-up of car stocks on the part of car dealers would not necessarily make the system fail, but would only implicitly transfer to the latter the accumulation of some foreign exchange reserves in the form of automobiles.

⁶⁶With automobiles alone, the scheme would be feasible. Today Chilean purchases are about 25 thousand units a year and tariffs are 120 percent. Hence, at an average CIF price of 4 thousand dollars per car, they would generate fiscal revenues of 120 million dollars. A 5 cent per pound copper price reduction implies today about 100 million dollars less in fiscal revenues, so an increase of tariffs on cars from 120 percent to 170 percent would compensate half the fall of copper revenues if price elasticity of demand for automobiles were

equal to one, and it would help to reduce the balance of payments deficits by 20 million dollars as a consequence of the fall in the quantity of cars imported.

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ISSUES IN THE DEVELOPMENT OF RESOURCE-RICH LDCs:
COPPER IN CHILE
A COMMENT

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In this very interesting paper, which is relatively short by the standards of the present conference, Dr. Tironi discusses the issues and problems of mineral resource-based development using the postwar Chilean experience as a case study. A brief survey of development theories relating to the role of mineral resources is first presented, followed by a description of the structure and performance of the Chilean copper industry since the early 1950's. The paper then discusses, in a well-organized way, the nature of policies affecting the industry and evaluates their effectiveness. The last part of the paper takes on a more normative character, examining specific policies that could lead, it is argued, to a greater contribution of the copper industry to Chile's economic growth.

Before commenting on the policy aspects, which constitute the more substantive part of Dr. Tironi's paper, I would like to raise a few minor points relating to the earlier sections. We are told of the heterogeneity of the copper industry in Chile, distinction being made between the large-scale copper mining (LCM) sector consisting of the four firms that exploit the country's largest ore deposits and the small- and medium-scale (SMCM) sector which was able to double its share of total copper output over the period from the late 1950's to the early 1970's. It would have been very useful to know the characteristics of the SMCM sector and the underlying reasons for its rapid growth, which could perhaps be tied to the later discussion of both the descriptive and normative aspects of Chilean policy towards the copper industry. For instance, the presumably higher labor

intensity of the SMCM sector has implications for the capacity of the industry to generate additional employment. While we are given a reference for details about the SMCM sector, no discussion is provided on the desirability of possible changes in industry structure induced by appropriate policies.

I am somewhat doubtful of the reliability and usefulness of the rate-of-return figures given towards the end of Section II. The ratio of net profits to book value of capital is not particularly meaningful under conditions of transfer pricing and accelerated depreciation policy. Also, without adjusting for the discrepancy between market and shadow prices of resources (including foreign exchange) caused by market distortions, any measure of the rate of return is not likely to reflect the social desirability of investment in developing countries.

In his discussion of policies toward multinational corporations, Dr. Tironi draws attention to the difficulty experienced by Chilean policymakers in formulating an optimal policy that would insure the maximization of the present value of the surplus obtained in the long run. The description of ownership and surplus extraction policies and their effects on government revenue is very illuminating. One specific policy lesson concerns the observed ineffectiveness of domestic currency overvaluation (his terminology is "artificially undervalued exchange rate") due to the high degree of substitutability between imported and locally-produced inputs in copper production. (Whether this is also true in other LDCs less industrially developed than Chile needs to be checked.) It is also noteworthy that as early as 1955 the Chilean government had begun to train technical personnel for the regulation of MNC accounting practices, imports and marketing, resulting in, among other things, a substantial decrease in the import component of the industry's input structure (from 60 percent in 1955-57 to 28 percent in 1970-71). By the end of the late 1960s it would appear also that the marketing expertise of this technical staff was on a par with that of the MNCs. This facilitated in no small way the movement towards nationalization of the copper industry, which could easily have been a traumatic experience without such a degree of preparedness by the government staff.

Dr. Tironi infers the effect of the nationalization policy on government revenue to be about US \$100 million from a comparison of the calculated net surplus per pound of copper produced in 1956-70 and in 1976. I think that the basis for the inference is questionable; instead of using the 1956-70 average, he should have extrapolated the trend in determining what the surplus would have been in 1976 without nationalization.

Dr. Tironi describes some external diseconomies of increasing the importance of the copper mining sector in the national economy in terms of the country's exposure to external instability, low employment generating capacity and weak inter-industry linkages. On these grounds he argues for the efficient planning and regulation of the industry, which may entail a lower degree of specialization in copper production than that resulting from free trade. Also, he advocates investment of the economic surplus into relatively labor-intensive sectors both inside and outside the copper industry. (Promotion of the small- and medium-scale copper mining sector could have been examined in this part of Dr. Tironi's paper.)

It is rather surprising that he would prefer to have Chile move out of the production of refined copper and specialize more in exports of copper concentrates. Even if it were possible in exchange "to negotiate an easier access to the manufacture's market" and quite apart from the comparative advantage in the production of the two commodities, I cannot imagine the Chilean authorities shutting down existing copper refining plants. Perhaps what might be considered would be to simply stop expanding refining capacity in the future.

As a final policy issue, the instability problem is examined by Dr. Tironi in some detail. Copper prices have been fluctuating significantly in the postwar period (by an average annual change of 12 percent, relative to the purchasing power of the U.S. dollar), a problem which the CIPEC is not expected to solve in any significant way. The paper discusses some domestic policy measures designed to alleviate the problem, but in the end it is acknowledged that a certain

degree of fiscal discipline is necessary to be able to adhere to a policy of relating annual government expenditures to the expected long-run copper price. (Why not also quantity?) Assuming that it is not impossible to get a consensus on such a price level (unfortunately, not precisely defined in the paper), Dr. Tironi recommends the establishment of an autonomous institution, the "Copper Stabilization and Investment Fund," empowered to allocate and invest copper revenues under certain well-publicized guidelines. In addition, it is also suggested that some form of "structural adjustment" should be built into the country's tariff system, specifically a variable tariff schedule for inessential consumer imports related to the actual levels of the copper price. This would automatically adjust tariff revenues in the opposite direction of the change in copper export price. In view of their temporal character, the higher tariff rates at times of depressed copper prices are not supposed "to encourage production, nor reduce the quantity imported so much as to reduce fiscal revenues from tariffs." I think this is unrealistic. Moreover, capital goods are not subject to variable tariffs "to avoid having their prices fluctuating with those of copper" and "to make investment independent of a short-run phenomenon." Drawing from the effective protection literature, it would seem to me that a bias in the incentive structure and attendant inefficiency in resource allocation will result from the implementation of the suggested variable tariff policy.

But I should not end my comments on a critical note. Overall I find Dr. Tironi's paper most informative and interesting. Personally I wish that policy managers in Asian and African countries with less experience in mineral resource development could have access to information on the Latin American experiences, such as this paper by Dr. Tironi, and learn the policy lessons the easy way.

ISSUES IN THE DEVELOPMENT OF RESOURCE-RICH LDCs:
COPPER IN CHILE
A COMMENT

Danny M. Leipziger*

Let me say first that I found Mr. Tironi's paper to be an excellent case study and, given my lack of particular expertise in the copper industry, I certainly would not quarrel with any of the detailed arguments in the paper.

My major criticism of the paper -- indeed my only criticism -- is that the copper sector is analyzed pretty much in isolation rather than as an integral part of the economy. There is some discussion of government revenue linkages, but it would seem to me that to propose an expansion of copper as the leading sector in the economy's growth as is done towards the end of the paper, without a discussion of a development strategy, is a throwback to a dualistic economy. I think this could easily be accomplished with a discussion of how to use the additional foreign exchange generated, and how development targets such as employment and income distribution can be affected. Admittedly, copper exports account for 75 percent of total exports, but wouldn't a plan for Chile in the year 1987 involve a lesser dependence on copper?

My second point is one of reinforcement -- I think it is terribly important to stress the role of commodity export earnings in public expenditure policy. This is where the short-term instability issue confronts us once again. We know that transitory income tends to be spent often, as I mentioned yesterday, on wage increases in the public sector with fallout effects on general wage levels, prices of non-

*These comments do not necessarily reflect the policy or views of the Agency for International Development.

traded goods and the structure of production. A recent study on Ghana demonstrates that changes in cocoa earnings are almost perfectly correlated with changes in government spending. I therefore liked Tironi's point about spending an average of long-run expected earnings or entering into long-term supplier contracts where the risk can be transferred (at a price, of course) to companies which are more diversified and better able to absorb such fluctuations.

A more formal treatment of optimal government policy would require a discussion on the rate-of-time preference, the price of purchasing certainty, the costs and benefits of earnings fluctuations, and the probability of their occurrence.

Now we come to minor questions: (1) Tironi suggests that costs in the 1960s and 1976 were equal in real terms which I find curious unless copper mining is not energy-intensive; (2) the argument that copper production should be expanded does not include any discussion of opportunity costs, which might be relevant, especially if either foreign exchange or budget revenues are involved; (3) in the final section of the paper I think Tironi wants to consider not only average price changes but also the variance of prices; (4) and lastly, I was very interested in Tironi's point that Chile has no comparative advantage in refining (and this relates to Mr. Switucha's earlier comment on Canada). I would like some elaboration of the relative size of value-added, employment, stability of earnings and long-term demand prospects in processed copper, because perhaps the Group of 77 (and UNCTAD) are off on the wrong tangent.

ISSUES IN THE DEVELOPMENT OF RESOURCE-RICH LDCs:

COPPER IN CHILE

GENERAL DISCUSSION

Tironi opened the general discussion with several clarifications. First, small- and medium-sized firms in the copper sector were more involved in processing copper concentrate than in refining. Since the former was more labor-intensive, this sector could be easily expanded without foreign investment or foreign firms. No detailed studies on value-added have been made of this sector, partly because of variations due to innovations in transport. Second, he estimated the long-run copper price by a seven-year moving average, which was reasonable in view of econometric evidence which indicated that copper prices followed an eight-year cycle. The establishment of an independent agency to tie copper-export revenue expenditures to the long-term price was important because undisciplined fiscal spending of export revenues, which amounted to approximately half the domestic money supply, was destabilizing. Third, the variable-tariff scheme was realistic in the sense that politicians could be educated on its importance. It would not have negative resource allocation effects since it would only be tied to a few specific goods which were not domestically produced. The whole purpose of the scheme was to offset domestic allocation effects of fluctuating copper prices.

Participants received favorably the proposal to keep copper revenue expenditures on a long-term path. Application of excess copper revenues to domestic stabilization policy was dangerous. However, the proposal would work only if the copper market behaved according to historical patterns. If the variance of copper prices was outside the normal experience, as it was recently, then a copper revenue fund could be bankrupted. Hence some second-string support policies, such as the variable-tariff scheme, were needed.

The variable-tariff proposal was received more skeptically. Tariffs are politically difficult to manipulate, since high tariffs

generate political pressures to keep them high. Also variable tariffs may not be acceptable to trading partner countries. More fundamentally, if economic agents expect tariff changes to be temporary, then they will simply adjust inventories and the tariff policy will be ineffective. Monetary policy would be a more effective stabilization tool. Tironi replied that a tariff policy was preferable to monetary policy because it imposed smaller macroeconomic adjustment costs. There were problems with a tariff policy, particularly concerning expectations, and details needed to be worked out. He stressed that a variable tariff policy was strictly a second-best solution. The first-best solution was the external stabilization of copper prices.

A participant thought that Tironi was too pessimistic about the possibility for external price stabilization. Progress had been made on an agreement for an international price stabilization scheme financed from common funds. Such an agreement was certainly in the interest of both consuming and producing nations. Another participant warned that complexities of the copper market defied ready solution and that proposals would have to be elaborated considerably.

Another participant warned that any price stabilization scheme should be combined with domestic financial stabilization policies. He proposed that a resource-exporting country should accumulate net foreign financial assets in an upswing, and decumulate them in a downswing. These investments should be channeled through newly-created third-world capital markets.

In general, developing countries should pay more attention to the relationship between development and financial planning. Another participant warned that segmentation of capital markets was both unnecessary and undesirable. It was unnecessary because established capital markets were becoming increasingly efficient. It was undesirable because the riskiest investments would be channeled through the third world markets.

An alternative Chilean viewpoint was that the importance of the copper sector must be understood in the context of overall development and trade policies. Chile is rich in other natural resources,

including other minerals, forests, fisheries, and agricultural lands. But high effective tariffs imposed by government import substitution policies created a bias against non-copper exports, and this is the main reason why copper provides 80 percent of export earnings. More relaxed trade policies have provoked a boom in non-copper exports, and, as a result, four years from now copper will probably contribute less than 50 percent to export earnings. Thus, export diversification is one benefit to Chile of opening up its economy. Tironi replied that trade policies did not have distortive relative price effects, because of large investment discontinuities in the copper industry, and restated his opinion that laissez-faire policies would lead to more and not less copper specialization.

Some participants thought that the pros and cons of nationalization needed further discussion. Government mining operations have not been trouble free. Some objective indicators of the success of nationalization were clearly needed. Tironi countered that Chile had reached a point of technical skill where domestic management of the copper industry was possible. Foreign investment created political problems, instability, and other costs and was therefore undesirable. The fears of disrupted production following nationalization were exaggerated although there were some problems resulting from labor disputes and political struggles. Today Chile has demonstrated that it can mine copper efficiently, which is evidenced by the fact that the real mining costs are approximately at 1970 levels.

A participant argued that Tironi underestimated the impact of copper industry expansion on employment by looking only at direct linkages. The indirect effects were in general insufficiently treated. Another agreed that Chile had no comparative advantage in copper refining, but thought that an expansion of concentrate exports was inadvisable since trade in these had peaked. There were, however, advantages in developing forward linkages, and this was an obvious direction for export diversification.

NATURAL RESOURCE PROBLEMS IN A RESOURCE-POOR DEVELOPING COUNTRY:
THE KOREAN CASE

Wontack Hong

1. Introduction

This paper investigates the natural resource problems in a resource-poor developing country on the basis of Korea's experience. The paper concentrates on the problem of non-oil mineral imports which have risen fairly rapidly in Korea since 1974 and are expected to rise even more rapidly in the future. An overview of aspects of growth and trade and resource dependency of the Korean economy is followed by an investigation of the domestic industrial structure and the need for mineral resources for economic growth. Inflation in mineral prices and associated problems will also be examined.

2. Growth, Trade and Resource Dependency

The population density of Korea was 365 persons per square kilometer in 1976, which was the second highest in the world (next to Bangladesh) if one excludes such city states as Hong Kong and Singapore. Total population increased from about 21 million in 1953 to 26 million in 1962 and to about 36 million in 1976. As a result, the land endowment per person declined from about 4,700 square meters in 1953 to 3,800 square meters in 1962 and to about 2,700 square meters in 1976. Since about 20 percent of the total land in Korea is currently arable, the per capita arable land amounted to only about 540 square meters in 1976.

However, due to a successful export-oriented growth policy, Korea was able to achieve one of the highest growth rates in the world during 1962-76, which covers the First, Second and Third Five-Year Plan

Table 1. Major Economic Indicators for Growth and Trade in Korea

	Popu- lation-1/ million	Gross National Product					In (Million) 1970 Dollars or Million Persons ^{2/}		
		Total GNP	Primary Sector	Manu- facturing	SOC & Service	Goods & Services Exports	Goods & Imports		
1953	21.05	2,716(129)	1,310(62)	165 (8)	1,241 (59)	55 (3)	352 (17)		
1954	21.27	2,866(135)	1,398(66)	195 (9)	1,273 (60)	33 (2)	251 (12)		
1955	21.50	3,021(141)	1,436(67)	240 (11)	1,345 (63)	41 (2)	337 (16)		
1956	22.15	3,034(137)	1,353(61)	282 (13)	1,359 (63)	37 (2)	394 (18)		
1957	22.82	3,266(143)	1,481(65)	305 (13)	1,480 (65)	50 (2)	466 (20)		
1958	23.51	3,436(146)	1,571(67)	332 (14)	1,533 (65)	63 (3)	403 (17)		
1959	24.22	3,568(147)	1,557(64)	363 (15)	1,648 (68)	74 (3)	330 (14)		
1960	24.95	3,637(146)	1,550(62)	393 (16)	1,684 (68)	88 (4)	378 (15)		
1961	25.77	3,814(148)	1,733(67)	405 (16)	1,676 (65)	123 (5)	343 (13)		
1962	26.51	3,931(148)	1,647(62)	458 (17)	1,826 (69)	138 (5)	455 (17)		
1963	27.26	4,277(157)	1,778(65)	538 (20)	1,961 (72)	149 (5)	577 (21)		
1964	27.98	4,643(166)	2,050(73)	573 (20)	2,020 (72)	184 (7)	429 (15)		
1965	28.71	4,925(172)	2,008(70)	687 (24)	2,220 (77)	258 (9)	482 (17)		
1966	29.44	5,535(188)	2,230(76)	805 (27)	2,500 (85)	394 (13)	766 (26)		
1967	30.13	5,966(198)	2,131(71)	988 (33)	2,847 (94)	534 (18)	1,033 (34)		
1968	30.84	6,720(218)	2,180(71)	1,255 (41)	3,285(107)	757 (25)	1,507 (49)		
1969	31.54	7,729(245)	2,441(77)	1,523 (48)	3,765(119)	998 (32)	1,879 (60)		
1970	32.24	8,336(259)	2,432(75)	1,803 (56)	4,101(127)	1,227 (38)	2,068 (64)		
1971	32.88	9,101(277)	2,510(76)	2,122 (65)	4,469(136)	1,479 (45)	2,491 (76)		
1972	33.51	9,735(291)	2,551(76)	2,456 (73)	4,728(141)	2,071 (62)	2,580 (77)		
1973	34.10	11,342(333)	2,704(79)	3,216 (94)	5,422(159)	3,330 (98)	3,500(103)	3/	
1974	34.69	12,271(354)	2,830(81)	3,777(109)	5,664(164)	3,254 (94)	3,617(104)	3/	
1975	35.28	13,285(377)	3,005(85)	4,265(121)	6,015(170)	3,780(107)	3,651(103)	3/	
1976P	35.86	15,318(427)	3,257(91)	5,368(150)	6,692(187)	5,299(148)	4,500(125)	3/	

Sources & Notes to Table 1.

Source: Economic Planning Board, Korea Statistical Yearbook, 1960 Population and Housing Census of Korea, 1966 Population Census Report of Korea, and Korean Population Projection (1975-85), and the Bank of Korea, National Income in Korea.

Notes : 1. Population figures for intercensal years were obtained by applying constant average annual growth rates.

2. Figures in parentheses represent "per capita" values in 1970 dollars.

3. In 1970 constant dollar prices, Korea could achieve a balance in current account. However, due to quadrupling oil prices, the balance of payment deficit amounted to \$2.0 billion in 1974 and \$1.9 billion in 1975 in current prices.

periods. Over that period, per capita GNP in 1976 dollars rose from about \$245 to about \$700, for an average annual growth rate of nearly 8 percent.¹ The average annual growth rate of GNP exceeded 10 percent. Korea's exports, which amounted to less than \$0.1 billion before 1962, increased at an average annual rate of more than 40 percent (about 35 percent in 1970 constant prices) from 1962 to 1976 and totalled nearly \$8.0 billion in 1976. The ratio of merchandise exports to GNP increased from about 2 to 30 percent. By 1976 about 35 percent of GNP originated in manufacturing (12 percent in 1962), and manufactured products constituted more than 90 percent of total merchandise exports which had never exceeded the 20 percent level between 1953 and 1961. The major manufactured exports in the 1960s were textiles, wearing apparel, plywood and various miscellaneous manufactures. In the early 1970s, electronic products, steel and metal products were added to the list of major export goods. It is planned, and also expected, that Korea will be exporting a large amount of electrical and non-electrical machinery and transport equipment (such as ships and parts for motor vehicles) by the end of the Fourth Five-Year Plan period (1977-81).

Since 1973, more than one third of total workers in manufacturing have been employed in production for exports. The total number of employed persons increased from about 7.7 million in 1963 to about 13.0 million in 1976 while the number of persons employed in manufacturing increased from about 0.6 million in 1963 to about 2.5 million in 1976.

The target for merchandise exports in 1977 was \$10 billion (and was achieved), that of service exports (such as construction, transportation, tourism, etc.) was \$2 billion, and the target GNP growth rate for 1977 was 10 percent, which was also accomplished. The Fourth Five Year Plan aims at achieving a per capita GNP of about \$1,500 and merchandise exports of \$20 billion in current dollar prices by 1981, but this export target is regarded as too conservative by the World Bank experts. Quite a few people have added up all such major economic indicators and have concluded that Korea has been one of the most successfully growing economies in the world since 1962.

And yet, perhaps as a result of this successful growth, the Korean people are becoming more concerned about the nation's future survival prospects because of international competition. The major question seems to be whether a (natural) resource-poor country like Korea can survive the seemingly aggravating tyranny of resource-rich wealthy countries. Constantly increasing prices for natural resources, increasing protectionism, and the 200-mile fishing limits are but a few readily identifiable sources of concern. This paper, however, will limit its focus to a discussion of mineral resource problems of Korea.

According to Table 1, in 1974 goods and service exports in 1970 dollar prices were very close to goods and service imports in 1970 prices and, in 1975, the former exceeded the latter slightly, implying a balance of payments surplus in the current account. However, in current dollar prices, the balance of payments deficits amounted to \$2.0 billion in 1974 and \$1.9 billion in 1975, which were mostly attributable to the oil crisis and the associated inflation in raw material prices.

In the 1950s, mineral ores and concentrates accounted for close to half of the total annual merchandise exports. However, their share steadily and rapidly declined in the 1960s, and it amounted to only about one percent of total exports in 1975. In the 1960s, minerals were still among the major export items from Korea. With the continuous rapid expansion of manufactured exports, however, mineral exports became insignificant by the 1970s.

Imports of mineral ores and concentrates were negligible during the colonial period (1910-45) and in the 1950s. Even in the 1960s, mineral imports amounted to only around one percent of total commodity imports. On the other hand, the imports of crude oil steadily increased from about 3 percent of total imports in 1964 to 6 percent in 1973 and then, due to the oil crisis, jumped to 18 percent in 1976.

Therefore, Korea did not experience serious problems associated with mineral imports until very recently. In its previous stage of industrialization, Korea's demand for mineral products could be satisfied by directly importing processed mineral products, such as non-metallic mineral products, iron and steel products, ferrous and

nonferrous metals and finished metal products. These amounted to around 5 percent of total merchandise imports during 1953-61 and around 10 percent thereafter. Although there was a steady increase of imported crude oil from 1963 to 1973, it did not reach crisis proportions until 1974.

Before 1962 annual exports amounted to only around \$20 to 40 million. During 1953-57, minerals made up between 51 and 99 percent of total exports and during 1958-61 between 34 and 44 percent, while the balance was mainly made up of fishery products and miscellaneous primary goods.² Imports of minerals, on the other hand, were negligible because of the backward state of the mineral processing industry and amounted to less than one million dollars per annum during 1954-60. Annual commodity imports amounted to about \$300 to \$400 million during 1953-61, and were financed mostly by U.S. grants-in-aid. Manufactures of minerals such as nonmetallic mineral products, iron and steel products, ferrous and nonferrous metals and finished metal products constituted 5 to 7 percent of total commodity imports before 1962.

Since 1962 the share of mineral exports in total merchandise exports has declined rapidly, from 22 percent in 1962 to 9 percent in 1967, to 2 percent in 1972 and to less than one percent in 1976, although there was a slight increase in the absolute amount of mineral exports. Minerals, together with other primary goods such as fishery and agricultural products, made a negligible contribution to the rapid expansion of Korea's exports which has occurred since 1962.

Exports of mineral manufactures such as plates and sheets of iron or steel, steel tubes and pipes, and various other iron and steel products have steadily increased in absolute terms. They maintained a constant share (4 to 5 percent) of the rapidly expanding exports during 1967-71 and began to increase their share in total exports to 9 percent in 1972 and 15 percent in 1974. The absolute amount of mineral manufactures exports amounted to about \$1.5 million in 1962, \$17 million in 1966, \$55 million in 1971, \$146 million in 1972 and nearly \$700 million in 1974. However, until 1972, there was no matching expansion in mineral ore imports, reflecting the fact that mineral

Table 2. Trade of Minerals and Related Goods

I-O Classification	In Million Dollars						
	Total Commodity Exports	Exports of Minerals	Manufactures of Minerals Exports	Total Commodity Imports	Imports of Crude Oil	Other Minerals Imports	Iron & Manufactures of Minerals Imports
1953	39.6	39.3(99%)	1.0 (3%)	345.4		1.8(1%)	3.1 (1%)
1954	24.2	15.0(62%)	0.2 (1%)	243.3		0.8(0%)	5.8 (2%)
1955	18.0	9.1(51%)	1.1 (6%)	341.4		0.4(0%)	10.2 (3%)
1956	24.6	14.9(61%)	1.4 (6%)	386.1		0.5(0%)	28.3 (7%)
1957	22.2	11.5(52%)	1.2 (5%)	442.2		1.7(0%)	28.0 (6%)
1958	16.5	7.3(44%)	1.4 (8%)	378.2		0.7(0%)	28.6 (8%)
1959	19.8	8.5(43%)	0.6 (3%)	303.8		0.3(0%)	15.1 (5%)
1960	32.8	11.3(34%)	1.4 (4%)	343.5		0.9(0%)	21.7 (6%)
1961	40.9	14.1(34%)	1.7 (4%)	316.1		5.1(2%)	16.5 (5%)
1962	54.8	12.3(22%)	1.5 (3%)	421.8		4.9(1%)	40.3(10%)
1963	86.8	15.2(18%)	13.2(15%)	560.3		7.1(1%)	55.8(10%)
1964	119.1	20.0(17%)	9.9 (8%)	404.4	12.3 (3%)	5.7(1%)	24.7 (6%)
1965	175.1	23.8(14%)	20.6(12%)	463.4	21.8 (5%)	5.0(1%)	42.4 (9%)
1966	250.3	26.6(11%)	16.9 (7%)	716.4	29.3 (4%)	4.7(1%)	75.7(11%)
1967	320.2	28.8 (9%)	11.7 (4%)	996.2	38.0 (4%)	8.1(1%)	109.4(11%)
1968	455.4	33.7 (7%)	13.3 (3%)	1,462.9	56.1 (4%)	16.8(1%)	131.8 (9%)
1969	622.5	35.5 (6%)	24.7 (4%)	1,823.6	99.3 (5%)	22.8(1%)	165.8 (9%)
1970	835.2	43.4 (5%)	38.1 (5%)	1,984.0	123.2 (6%)	27.1(1%)	170.6 (9%)
1971	1,067.6	36.7 (3%)	55.2 (5%)	2,994.3	172.0 (7%)	32.7(1%)	216.8 (9%)
1972	1,624.1	33.7 (2%)	145.5 (9%)	2,522.0	206.3 (8%)	40.8(2%)	254.4(10%)
1973	3,275.0	42.8 (1%)	310.2(10%)	4,240.3	275.1 (7%)	97.9(2%)	442.5(10%)
1974	4,460.4	61.0 (1%)	677.3(15%)	6,851.8	961.6(14%)	171.7(3%)	678.2(10%)
1975	5,081.0	56.5 (1%)	468.3 (9%)	7,274.4	1,271.0(18%)	158.6(2%)	513.0 (7%)
1976	7,715.4			8,773.6	1,607.2(18%)		150.3(2%)

Source: Wontack Hong, Factor Supply and Factor Intensity of Trade in Korea (Seoul: KDI Press, 1976).

Note : Manufactures of minerals represent nonmetallic mineral products, iron & steel products, nonferrous metal, and metal products.

manufactures exports depended mostly upon imported intermediate inputs such as hot coil, and depended very little on domestic mineral processing.

Between 1961 and 1971 mineral imports increased steadily in absolute terms from about \$5 million in 1961 to about \$33 million in 1971, but their share remained at around one percent of total imports. However, since 1972 imports of minerals have increased fairly rapidly, amounting to about \$160 million in 1974 which represented about 2 percent of total imports for that year. The construction of a million ton capacity steel mill in 1972-73 contributed greatly to the expanding mineral imports. On the other hand, imports of manufactures of minerals amounted to around 6 percent of total imports before 1962. Due to the rapid growth of the Korean economy since 1962 and the increasing demand for intermediate inputs for export production, the share of their imports increased to around 10 percent between 1962 and 1976. Although their relative share did not increase continuously, the magnitude of imports has rapidly expanded since 1962 and the absolute amount of mineral manufactures imports has also rapidly increased.

There were no imports of crude oil in the 1950s. However, with the construction of several oil refineries, imports of crude oil increased from about \$12 million in 1964 to about \$40 million in 1967, to \$275 million in 1973 and, due to rising oil prices, to nearly one billion dollars in 1974 and to about \$1.6 billion in 1976. The share of crude oil imports in total merchandise imports steadily increased from about 3 percent in 1964 to 7 percent in 1971. A number of people predicted that the share of crude oil imports would stabilize at around 7 to 8 percent of total imports, but the oil crisis in 1974 raised their share to as much as 14 percent of total imports in 1974 and to 18 percent in 1976.

Other than crude oil, Korea's major mineral imports include: (high grade) iron ore and concentrates, bituminous coal and coke for steel mills, phosphate for fertilizer manufacturing, asbestos, sulphur, copper ore, crude salt, manganese ore, titanium ore, tin ore, bituminous coal, and coke. There were also large imports of scrap and

waste iron, copper, aluminum, zinc, lead, and nickel.

As of 1976, total mineral exports amounted to only about \$60 million, while imports of minerals amounted to nearly \$300 million and those of crude oil amounted to about \$1,600 million. Imports and exports of mineral manufactures amounted to around \$500 million respectively. Although one cannot be sure whether imports of mineral manufactures and crude oil will grow more rapidly in the future, it is safe to expect a more rapid increase in imports of various mineral ores and concentrates.

Korea's endowment of coal and water for energy needs is very limited. The government has therefore undertaken construction of two atomic power plants and will construct several more plants in the near future. When they are completed it is hoped that atomic energy will replace a significant portion of crude oil imports. The Fourth Five-Year Plan envisions a significant expansion of exports of various mineral manufactures. However, these products can use either imported or domestic intermediate inputs. On the other hand, the plan to promote various mineral processing industries such as steel mills and ferrous and nonferrous metal refineries will certainly increase import demand for minerals substantially.

3. Industrial Structure and Need for Mineral Resources for Economic Growth

According to the Korean Input-Output Tables prepared by the Bank of Korea, slightly more than one percent of total intermediate inputs for all Korean industries consisted of minerals in 1963, while about 4 percent of total intermediate inputs consisted of mineral manufactures such as nonmetallic mineral products, iron and steel, steel products, ferrous and nonferrous metals, and finished metallic products. In 1973, minerals still shared only about one percent of total intermediate inputs, but crude oil took another one percent and mineral manufactures took about 6 percent. The import dependency of the entire Korean economy (total imports divided by total demand) was

about 7 percent in 1963, increasing to about 11 percent in 1973.

This leads to the observation that, while the relative share of non-oil minerals in intermediate inputs changed slightly during 1963-73, the share of mineral manufactures in total intermediate inputs increased by 50 percent (from 4 to 6 percent).

The total import dependency of minerals including crude oil (i.e., imports of minerals divided by total intermediate and final demand for minerals) was about 6 percent in 1963, but became about 60 percent in 1973. Even if we exclude crude oil, the total import dependency of minerals increased from 6 percent in 1963 to 19 percent in 1973.³

In 1963, about 15 percent of the imported minerals were allocated to SOC and service sectors (mostly coal for transportation and electricity) and the rest were allocated to manufacturing (i.e., 63 percent to nonmetallic mineral products, 11 percent to steel and metal products, 7 percent to the chemical sector and 3 percent to machinery). In 1973, however, only 3 percent of imported minerals were allocated to SOC and service sectors while the balance was allocated to manufacturing. That is, 29 percent of the total imported minerals were allocated to the nonmetallic mineral product sector, 52 percent to the steel and metal product sector, and 12 percent to the chemical sector. The proportion of imported minerals allocated to SOC and services and the nonmetallic mineral product sector has decreased substantially, while that to the steel and metal product sector has increased nearly five times (from 11 percent to 52 percent).

In 1963, only one percent of coal imports and 54 percent of metallic ore imports were used in steel and metal production. However, in 1973, about 95 percent of coal imports and 92 percent of metallic ore imports were used for these purposes.⁴ It can be concluded, therefore, that imports of coal and metallic ores are intended almost entirely for the steel and ferrous or nonferrous metal product sectors while those of nonmetallic minerals are intended primarily for the nonmetallic mineral product and chemical sectors. Obviously, the demand for imported coal, metallic ores and nonmetallic minerals will

Table 3. Industry (Import) Transactions Table for 1963: At Producer's Current Market Prices

Output Sector		In Million Won			
Input Sector		Coal	Metallic Ores	Nonmetallic Minerals	Total Minerals
A. Primary Sectors		107 (0)	0 (0)	90 (0)	197 (0)
B. Manufacturing		6,033(305)	505(62)	1,304(265)	7,842(632)
Petroleum & Coal		4,232 (0)	0 (0)	62 (0)	4,294 (0)
Nonmetallic Mineral		411(293)	4 (2)	656(131)	1,071(426)
Chemical Products		160 (1)	0 (0)	153 (53)	313 (54)
Steel & Metal		156 (2)	476(36)	164 (50)	795 (88)
Machinery		124 (1)	23(23)	23 (0)	170 (24)
Other Manufactures		950 (8)	1 (1)	247 (31)	1,199 (40)
C. SOC & Service Sectors		1,098(119)	1 (0)	961 (0)	2,059(119)
D. Intermediate Demand		7,238(424)	506(62)	2,354(265)	10,097(750)
Domestic Demand		549(-54)	76 (4)	1,365(106)	1,990 (56)
Exports		273 (0)	1,324 (0)	386 (0)	1,984 (0)
E. Total Final Demand		822(-54)	1,401 (4)	1,752(106)	3,974 (56)
F. - Imports		350	66	351	767
G. - Custom Duties		19	1	19	39
Total Output		7,681	1,840	3,735	13,266
Import Dependency (F+G)/(D+E) Total		5%	4%	9%	6%
Intermediate Input		6%	12%	11%	7%
					24,423

Source: The Bank of Korea, Korean Input-Output Table for 1963.

Note : Figures in the parentheses represent imports.

Table 4. Industry (Import) Transactions Table for 1973: At Producer's Current Market Price

Input Sector	Output Sector		In Million Won		
	Coal	Metallic Ores	Nonmetallic Minerals	Total Minerals	Manufactures of Minerals
A. Primary Sectors	82 (2)	0 (0)	957 (0)	1,045 (61)	8,339 (1,706)
B. Manufactures	42,485 (5,695)	10,620 (6,593)	26,544 (9,915)	79,649 (22,203)	390,306 (189,022)
Petroleum & Coal	34,027 (6)	0 (0)	196 (0)	34,223 (6)	2,481 (728)
Nonmetallic Mineral	1,250 (181)	657 (157)	18,161 (6,375)	20,109 (6,713)	12,295 (1,087)
Chemical Products	322 (11)	136 (22)	5,022 (2,732)	5,480 (2,765)	6,480 (1,847)
Steel & Metal	5,852 (5,453)	9,679 (6,354)	839 (379)	16,370 (11,986)	230,207 (126,482)
Machinery	199 (18)	41 (22)	404 (112)	644 (152)	104,159 (48,727)
Other Manufactures	794 (26)	107 (38)	1,922 (517)	2,823 (581)	34,704 (10,151)
C. SOC & Service Sectors	4,375 (0)	1,006 (165)	14,655 (499)	20,036 (664)	214,298 (40,595)
D. Intermediate Demand	46,947 (5,697)	11,625 (6,758)	42,157 (10,473)	100,729 (22,928)	612,963 (231,322)
Domestic Demand	-1,660 (24)	2,743 (158)	4,909 (-267)	5,992 (-85)	25,621 (3,652)
Exports	734 (0)	8,733 (0)	3,578 (0)	13,045 (0)	119,240 (0)
E. Total Final Demand	-826 (24)	11,476 (158)	8,487 (-267)	19,137 (-85)	144,861 (3,652)
F. - Imports	5,690	6,781	8,935	21,406	221,373
G. - Custom Duties	32	135	1,270	1,437	13,601
Total Output	40,400	16,185	40,439	97,024	522,850
Import Dependency (F+G)/(D+E) Total	12%	30%	20%	19%	31%
Intermediate Input	12%	58%	25%	23%	38%

Source: The Bank of Korea, Korean Input-Output Table for 1973.

Note: Figures in the parentheses represent imports. Crude oil is not included.

Table 5. Fourth Five-Year Plan on Output and Exports by Industries

	1975	1981	Av. Annual Growth Rate (1977-81)
(In Billion 1975 Won)			
GNP	9,080(100%)	16,214(100%)	9%
Primary Sectors	2,419 (27%)	3,193 (20%)	4%
SOC & Service	4,080 (45%)	6,586 (41%)	8%
Manufacturing	2,581 (28%)	6,436 (40%)	14%
Heavy & Chemical	1,094 (12%)	3,184 (20%)	17%
Iron & Steel ^{1/}	58 (1%)	200 (1%)	-
Nonferrous Metals ^{2/}	9 (0%)	36 (0%)	-
Machinery	383 (4%)	1,554 (10%)	22%
Chemicals	644 (7%)	1,394 (9%)	13%
Light Industry	1,487 (16%)	3,248 (20%)	12%
(In Million 1975 Dollars)			
Total Commodity Exports	5,081(100%)	14,165(100%)	16%
Primary Goods	770 (15%)	1,130 (8%)	11%
Heavy & Chemical	1,492 (29%)	6,515 (46%)	24%
Steel & Metal	367 (7%)	1,040 (7%)	16%
Machinery	836 (16%)	4,265 (30%)	26%
Light Manufactures	2,819 (56%)	6,520 (46%)	11%

Source: Economic Planning Board.

- Notes: 1. The gross output value of iron & steel is planned to increase from 351 billion won in 1975 to 1,214 billion won in 1981.
2. The gross output value of nonferrous metals is planned to increase from 66 billion won in 1975 to 256 billion won in 1981.

Table 6. Projected Imports of Crude Oil and Raw Materials for Steel Production

	1975		1979		1981	
	Unit Price	Domestic Demand	Actual Imports	Domestic Demand	Projected Imports	Projected Imports
In Million 1975 Dollars						
Crude Oil	(\$11.5/bbl)	1,271	1,271 (100%)	2,085	2,085 (100%)	2,523 (100%)
In Thousand Metric Tons						
Iron Ore	(\$16/MT)	1,858	1,494 (80%)	8,640	7,990 (90%)	10,063 (93%)
Bituminous Coal & Coke	(\$61/MT)	786	786 (100%)	4,400	4,400 (100%)	4,500 (100%)
Iron & Steel Scrap	(\$122/MT)	1,287	844 (65%)	3,000	2,500 (83%)	3,800 (85%)

Source: Economic Planning Board.

depend on the demand for various mineral manufactures such as steel and metal products, nonmetallic mineral products, and chemical products.

In 1963, the demand for mineral manufactures was mostly for intermediate inputs for SOC and services (37 percent), steel and metals (19 percent) and for machinery (12 percent). In 1973, the demand for steel and metal sectors increased significantly (30 percent), while that for SOC and service sectors experienced a relative decline (28 percent). A notable structural change in demand is that export demand had increased to 16 percent of total demand in 1973. The import dependency of intermediate input demand for manufactures of minerals increased from 31 percent in 1963 to 38 percent in 1973.

Since the Fourth Five-Year Plan emphasizes structural changes in output and export patterns toward so-called heavy and chemical industries, the output and demand for chemicals, nonmetallic mineral products, iron and steel, steel products, ferrous and nonferrous metals, and finished metal products are expected to grow more rapidly than those for light industrial products such as processed foods, textiles, clothing, wood products, and various miscellaneous manufactures. Since the heavy and chemical industries use a relatively large amount of minerals, total demand for minerals is expected to grow more rapidly than before. Furthermore, since the domestic supply of minerals is expected to grow more rapidly than before. Furthermore, since the domestic supply of minerals is rather limited, import demand for minerals is expected to grow fairly rapidly in the future.

The Economic Planning Board's (EPB) projection of raw material imports for steel production in 1981 amounts to about \$0.8 billion in 1975 prices (about 6 percent of total commodity imports), comprised of about \$150 million of iron ore, \$280 million of bituminous coal and coke and \$400 million of scrap iron. In 1975 the total cost for these imports was less than \$100 million. Projected imports of crude oil in 1981 will amount to about \$2.5 billion in 1975 prices (about 18 percent of total imports), which may be an under-estimate. This implies that nearly a quarter of total commodity imports in 1981 (about \$14 billion in 1975 prices) will consist of two major types of minerals--crude oil

and minerals for steel production.

Of course the demand for imports for other minerals such as phosphate, asbestos, sulphur, copper ore, manganese ore, titanium ore and tin ore, as well as the demand for scrap and waste copper, aluminum, zinc, and nickel, is also expected to grow rapidly. This increase is anticipated because the output of iron and steel is expected to rise 3.5 times during 1975-81 while the output of non ferrous metals should rise 4 times.⁵ In 1975, imports of these other minerals and scrap amounted to about \$140 million. Hence a crude extrapolation indicates a magnitude of non-oil minerals and scrap imports on the order of \$1.4 billion by 1981.

Imports of crude oil amounted to less than 10 percent of total imports and imports of other minerals and scrap never exceeded the 4 percent level until 1973. The share of crude oil, which amounted to 18 percent of total merchandise imports in 1975, is expected to increase to more than 18 percent of total imports by 1981 and the share of other minerals and scrap, which amounted to 5 percent in 1975, is expected to account for around 10 percent of total imports by 1981.

Although the absolute volume of iron and steel output and nonferrous metal output is expected to increase nearly four times, while exports of steel and metal products are expected to grow nearly three times during 1975-81, their relative share in total exports (7 percent in 1975) is not expected to expand, and their share in total output should only increase from 0.7 percent to about 1.5 percent. The structural shift toward heavy and chemical products is expected to be achieved by expanding the share of machinery such as electrical and nonelectrical machinery, electronic products, ships and other transport equipment and parts, and not through an extensive expansion of basic metals and chemicals. Therefore, the increase in imports of crude minerals would have less effect than a full scale import substitution of basic metals and chemicals and a greatly expanded relative share of those products in GNP. As a result, a continued large volume of mineral manufactured imports can be expected in the foreseeable future.

4. Mineral Price Inflation

The trend in "domestic" price inflation for minerals since 1961 has been similar to that of total commodity price indexes. The wholesale price index for all commodities was 38 in 1962 (1970=100) and increased to 265 in 1976. The wholesale price indexes for coal, metallic ores, and nonmetallic minerals were around 41-45 in 1962, increasing to around 225-250 in 1976. The only exception was the trend in prices for petroleum products which has increased from 70 in 1962 to 726 in 1976 reflecting the doubled crude oil price in 1973 which tripled thereafter.

Between 1960 and 1973 "international" prices were fairly stable for Korea's major mineral imports including iron ore, asbestos, copper ore, crude salt, manganese ore, and titanium ore. The price of Korea's most important export mineral, tungsten ore, has been fluctuating wildly and it has therefore become an unreliable source of foreign exchange. While Korea's other major mineral exports, including zinc ore, talc, lead ore, silver ore and graphite, have experienced a steady and significant increase in their international price, the absolute volume of these exports was rather small.

There has been a fairly rapid increase in (non-oil) mineral prices since 1973 (especially in 1974), which seems to have been reflected in rising prices for metals and metal products. The prices of imported metals and metal products rose by 33 percent in 1973 and 47 percent in 1974. However, the export prices of those products also increased by 32 percent in 1973 and 51 percent in 1974. In other words, the inflation in minerals was reflected in both imported mineral manufactures and exported mineral manufactures from Korea.

The impact of this inflation in mineral prices has spread to all commodity production in Korea. However, as long as Korea can shift a significant portion of the increased raw material costs to export prices of their manufactures, the effect on the balance of payments will be small and the growth rate of the overall economy will not be adversely influenced. The Korean economy can handle inflation in

Table 7. Domestic Wholesale Price Indexes of Minerals and Related Goods

All Commodities	Coal	Metallic Ores	Nonmetallic Ores	Metals & Metal Products	Petroleum Products
1957	29.2				
1958	27.3				
1959	28.0				
1960	31.0				
1961	35.1	38.4	46.2	37.4	33.2
					63.0
1962	38.4	40.7	44.6	40.9	
1963	46.3	42.1	43.3	41.4	35.4
1964	62.3	46.1	56.1	47.5	38.5
1965	68.5	55.9	73.6	54.8	53.1
1966	74.6	63.9	84.3	62.1	65.0
					73.0
1967	79.4	78.7	82.2	69.7	74.6
1968	85.8	84.1	102.4	84.3	80.1
1969	91.6	94.9	103.6	89.1	84.0
1970	100.0	100.0	100.0	100.0	100.0
1971	108.6	113.1	104.0	108.0	99.7
					123.5
1972	123.8	124.9	122.6	108.6	104.5
1973	132.4	131.8	133.7	112.1	130.2
1974	188.2	180.4	218.8	203.2	183.6
1975	238.0	229.8	223.0	215.1	197.9
1976	264.6	251.8	223.3	224.9	205.1
					725.7

Source: The Bank of Korea, *Economic Statistics Yearbook*.

Table 8. Index Numbers of Foreign Trade and Terms of Trade 1973=100

	Quantum Index		Unit Value Index		Net Barter Terms of Trade	Income Terms of Trade
	Exports	Imports	Exports	Imports		
1963	4.2	18.4	63.8	71.9	88.7	3.8
1964	5.7	13.2	65.2	72.8	89.5	5.1
1965	8.0	14.8	67.8	74.0	91.5	7.3
1966	10.5	22.8	73.9	72.4	102.0	10.7
1967	12.8	32.1	77.3	73.1	105.8	13.5
1968	17.7	47.8	79.7	72.3	110.2	19.5
1969	25.5	60.3	75.7	71.3	106.2	27.1
1970	32.8	63.3	79.1	74.0	106.9	35.1
1971	42.4	76.7	78.1	73.7	106.0	44.9
1972	63.8	79.4	79.0	74.9	105.5	67.3
1973	100.0	100.0	100.0	100.0	100.0	100.0
1974	109.2	103.9	126.6	155.6	81.4	88.9
1975	134.3	107.2	117.3	160.0	73.3	98.4
1976	182.6	132.0	131.1	156.7	83.5	152.6

Source: The Bank of Korea, Monthly Economic Statistics.

Note : Income terms by trade is net barter terms of trade (export unit value index divided by import unit value index) multiplied by export quantum index.

mineral prices simply as one of the never-ending fluctuations in exchange rates among various products.

The unit value index of Korea's exports was only 117 in 1975 (1973=100), while that of its imports was 160. Apparently, Korea was able to shift a very small portion of increased oil prices and associated raw material price inflation to foreign countries through mark-ups in its export prices during 1973-75. In 1976, however, the export unit value index was 131 compared to 157 for imports. The net barter terms of trade, which deteriorated to 73 in 1975, improved to 83 by 1976, while the income terms of trade were 153 due to the 52 percent increase in exports in 1976 in current dollar prices. The growth rate of GNP jumped from about 8.5 percent in 1974 and 1975 to 15.2 percent in 1976.

One can observe that although Korea cannot completely shift the impact of international price inflation to other countries through international trade, it can fairly successfully offset the adverse impacts of such inflation. A resource-poor developing country such as Korea, which has to depend heavily on imported raw materials for its own consumption and export production, can survive and even prosper if it cultivates the ability to adapt quickly to changing circumstances; for example, the ability to shift inflation in imported raw material prices to its export prices.

It seems highly unlikely that the type of inflation experienced in 1974 will be repeated in the near future. While the price of crude oil and other minerals may keep rising in nominal or real terms, the price increases should not be as sudden or as drastic in absolute magnitude in the future. However, as long as the Korean economy continues to enhance its ability to increase the value-added portion in its international transactions (as it has been doing since 1962), it is not overly optimistic to expect Korea to survive and even prosper regardless of the future trends in mineral prices.

Korea has imported crude oil from the Middle East, and most of its mineral ore, scrap and waste from the United States, Canada, Australia, Japan and several other Asian countries including Indonesia and Malaysia. In order to enhance stability in its raw material trade, Korea

must diversify its sources of imports to include Latin America and Africa.

5. Summary and Conclusion

Due to a successful export-oriented growth policy, Korea was able to achieve one of the highest growth rates in the world during 1962-76. Previously, the stage of industrialization in Korea was such that most of the demand for mineral products could be satisfied by directly importing processed mineral products, such as non-metallic mineral products, iron and steel products, ferrous and nonferrous metal products and finished metal products. Hence Korea had never experienced any serious problems associated with mineral imports until very recently.

Since the Fourth Five-Year Plan (1977-81) emphasizes structural changes in output and export patterns towards so-called heavy and chemical industries, and since these industries use a relatively large amount of minerals, total demand for minerals is expected to grow more rapidly than before. Furthermore, since the domestic supply of minerals is rather limited, the import demand for minerals is expected to grow fairly rapidly in the future. Nearly a quarter of total merchandise imports in 1981 may consist of two major types of minerals: crude oil and minerals for steel production. Of course the import demand for other minerals such as phosphate, asbestos, sulphur, copper ore, manganese ore, titanium ore and tin ore, as well as the demand for scrap and waste copper, aluminum, zinc and nickel, is also expected to increase rapidly.

Korea was able to survive the 1974 oil crisis and achieve a 10 percent average annual growth rate in GNP and more than 20 percent real growth in merchandise exports per annum (1974-76). A resource-poor developing country like Korea, which has to depend heavily on imported raw materials for its own consumption and export production, can survive and even prosper if it continues to enhance its ability to

adapt quickly to changing circumstances. Since the share of minerals in total commodity imports has been steadily increasing and is expected to increase further to around 30 percent by 1981, it would be much more difficult for the Korean economy to adapt itself to another round of drastic oil and mineral price increases. However, if the resource-rich countries such as the United States, Canada and Australia avoid self-centered trade policies which exploit resource-poor developing countries, and if other advanced countries maintain their position as rational and dependable leaders of the free world by refraining from ultra-protectionist policies, there would not appear to be any imminent danger for the South Korean economy, other than a possible direct invasion from North Korea.

FOOTNOTES

¹Applying the current exchange rate of 483 won per dollar to current won value of GNP in 1976 which implies that 1.638 U.S. dollars in 1976 are equivalent to one 1970 U.S. dollar. The U.S. wholesale price index was 166 in 1976 (1970=100).

²The major minerals exported from Korea were tungsten ore and concentrate, granite, zinc ore, quartz, kaolin, talc, lead ore, silver ore, graphite, gypsum, agalmatolite, and low-grade iron ore.

³The import dependency of the intermediate input demand for minerals increased from 7 percent in 1963 to 23 percent in 1973. Since there is no direct export demand or domestic final demand for imported minerals except those for the sake of variation in stock level, the increased total import dependency was entirely due to increased import dependency of intermediate input demand.

⁴In 1963 about 46 percent of total mineral imports were coal (mostly for SOC and service sectors and nonmetallic mineral products), 46 percent were nonmetallic minerals and only 8 percent were metallic ores. In 1973, however, coal represented only 25 percent of total mineral imports (exclusively for the steel and metal products) while 30 percent were metallic ores for the steel and metal products. The share of nonmetallic minerals, which was allocated mostly for non-metallic mineral products and the chemical sector, did not change.

⁵Output of zinc is to increase from 21,000 M/T to 80,000 M/T, that of copper from 28,000 M/T to 117,000 M/T and that of lead from 8,000 M/T to 58,000 M/T during 1977-81. See the Government of the Republic of Korea, The Fourth Five-Year Economic Development Plan: 1977-81, December 1976.

NATURAL RESOURCE PROBLEMS IN A RESOURCE-POOR DEVELOPING COUNTRY:
THE KOREAN CASE
A COMMENT

Francis K. Chan

Hong begins his paper with a quick run down of some of the economic indicators to show that the Korean economy is "one of the most successfully growing economies in the world since 1962." The high growth rate has paradoxically aroused concern among Koreans about the nation's prospect of future survival in the face of perceived changes in the international economic environment, as exemplified by the increased bargaining power of resource-rich countries on the one hand and the rising protectionist sentiment among some important developed countries such as the U.S. and the E.E.C. on the other. The message was brought home, so to speak, by the quadrupling of petroleum prices in 1973-74 with drastic consequences in balance of payments adjustment for the economy, which was already aggravated by inflation in raw material prices. For Korea the problem was getting worse, for while its share of export value of minerals in total annual commodity exports fell to insignificant proportions by the 1970's, that of mineral imports rose rapidly and is expected to rise even more rapidly in the future.

To maintain its high annual growth rate of better than 10 percent, Korean imports of minerals and oil increased absolutely and relatively to total imports through the strategy of raw material imports and export of manufactures. This greatly worsened the nation's dependency on imports of many basic materials from 6 percent in 1963 to about 60 percent in 1973, or 6 percent in 1963 to 19 percent in 1973 if crude oil is excluded. In the case of Korea, unlike that of Japan, imports of minerals consist mainly of processed minerals.

How did the Korean economy manage to pay for the tremendous

increase in the import bill for both minerals and oil resulting from the greatly increased volume of imports, as well as from the price inflation of the early 1970's? The answer is, in part, through passing on some of the increase of price inflation onto the importers of Korean manufactured products, especially after 1976, in the form of higher export prices. But presumably, a substantial deficit still remained to be financed somehow, though this matter was not pursued further in the paper.

Given the traumatic experience of the early 1970's, Hong remains fairly optimistic about the ability of the Korean economy to survive and even to prosper provided it is able "to adapt quickly to changing circumstances, for example, the ability to shift inflation in imported raw material prices to its export prices." The solution may become more difficult as the economy becomes more and more dependent on imported minerals and oil. Reduced dependence on imported oil is being sought through the construction of more nuclear power plants. The rest probably has to be handled the way it was (successfully) in the past, through export price inflation. Hong seems more concerned by the self-centered trade policies of developed resource-rich countries such as the United States, Canada and Australia. Presumably there are tariff and other trade policies to protect the domestic market against foreign imports from labor-abundant but resource-poor developing countries like Korea.

What lessons can resource-poor developing countries learn from the Korean experience? How much of the experience is peculiar to the Korean situation? Have all the crucial issues and problems of resource-poor developing countries, in the context of increasing dependence on imports of minerals and other raw materials needed for their economic growth, been raised? It seems useful to have such questions raised and answers provided and I am disappointed that the paper did not do this fully.

To the extent that Korea is typical of resource-poor developing countries, Hong's paper may be interpreted as implicitly saying that the role of these countries is one of more or less passively adjusting their economic development to the changing relative scarcity of

resources. The ideal situation is one in which the accidental and uneven resource endowments of countries can be compensated for effectively by free international trade. This is more likely to be true if the long-term prospects of resource supply are optimistic. In such an international economic order, the resource-poor developing countries will be relieved of an effective external constraint on growth and growth can then proceed by pushing hard on the comparative advantages of these countries, importing the necessary and needed resources from the cheapest source as they would in the case of other commodities in which they do not have comparable advantage.

If the prospects of resource supply are more pessimistic and there exists a tendency to control the free flow of resources through competitive markets, then resource-poor developing countries have to be worried by the additional external constraint on growth. In this respect, the resource-poor developing countries stand in a less advantageous position compared to the resource-poor developed countries, such as Japan. The increased vulnerability of the resource-poor developing countries is not balanced by factors which tend to strengthen the bargaining power of the resource-poor developed countries, namely the size of the domestic economy as a market for resources and the ability to devote R and D to look for technological solutions to the resource constraint. This use of technological capability by the developed countries as a substitution for international trade in resources has been pointed out by Magee and Robins. The resource-poor developing countries cannot effectively threaten to withdraw or cut back on imports (as Japan, for example, can) since each has an insignificant share of total world demand, nor do they have the technological capability to develop synthetics or resource-saving methods.

Unlike the three options discussed by Murota for long-term Japanese prospects, only one option exists for developing countries -- to buy resources in world markets -- which is not an attractive option in the context of our discussion. This does not imply that the resource-poor developing countries have no other options, because the

Murota framework is too restrictive. It has been suggested that resource-poor developing countries can resort to larger regional groupings or form an appropriate global bloc of similarly minded and disadvantaged countries. If the international order becomes fragmented into economic blocs or becomes dominated by giant economic units, these resource-poor developing countries may have to look for ways of gaining countervailing power to buttress their bargaining power in international transactions. Otherwise, they will lose out because they need the resource-rich countries or the technologically-sophisticated developed countries more than the latter need them and they have very few attractive options compared to the terms of exchange dictated to them. Because of this lack of bargaining power in the era of impending resource scarcity, the burden of having to make difficult and unpleasant adjustments to international economic disequilibrium is shifted to the resource-poor developing countries, who are usually least able to bear the costs of such adjustments. If this is Hong's fear, I share his concern. It is to be hoped that through sound policies and wise leadership by those best placed to have significant influence, the international economic order would not come to such a pass.

NATURAL RESOURCE PROBLEMS IN A RESOURCE-POOR DEVELOPING COUNTRY:
THE KOREAN CASE
A COMMENT

Yashichi Ohata

Hong's paper presents a very optimistic picture of the present Korean economy and its future prospects.

The size of the Korean economy is about one-tenth that of the Japanese economy. The absolute quantity of demand for natural resources by the Korean economy is proportionately low compared with the Japanese economy. Consequently, the national security problems concerning the procurement of natural resources have not become too serious as yet. The Korean economy, as a result, has been able to grow in the international market without diverting its attention to the national security problem. Korea has been one of several developing nations which has successful export-oriented growth and is beginning to show some characteristics of a medium-sized industrial nation. Its pattern of development will, in fact, serve as a good example for other developing countries.

According to Hong, Korea was able to survive the 1974 oil crisis with a 10-percent average annual growth rate in GNP, and more than 20-percent real growth in commodity exports per annum from 1974 to 1976. However, the price of natural resources and the balance of payments may begin to present serious problems to Korea in the near future as its economy continues to expand, and Korea may soon be required to reorganize its trade structure.

According to Hong, Korea has made its adjustment by maintaining a high level of economic growth in its export-oriented industries. However, would it be an exaggeration to say that the rapid and strong export-oriented industrialization will inevitably lead to an excessive bias in the domestic economy? In resource-rich countries it is

possible to promote export-substitution growth using domestic resources. A resource-poor country, on a similar course of export-oriented growth, will have to increase its dependency on imported natural resources. In short, this excessive emphasis may cause a serious distortion in domestic economic structure. Korea has been experiencing a gradual decline in its agricultural sector, conspicuously indicating the faults of export-oriented growth. Is it feasible for Korea, as a resource-poor nation, to maintain its present course of export orientation and, at the same time, foster balanced growth in its agricultural sector?

The most important problem for countries with limited natural resources is to secure a dependable supply of resources and to maintain stable prices. Japan achieved a high level of growth and development. Major reasons for this have been price stability of natural resources and strong dependability of supply. However, since 1974, Japan has been experiencing a depression and is still suffering from a low level of economic growth. There are two distinctively different types of industries in Japan: the internationally competitive industries such as automobiles and television, and the internationally weak industries such as petrochemicals and textiles. The Japanese economy is greatly dependent on imported petroleum, and there is a wide gap between oil-dependent industries and non oil-dependent industries in competitive strength. In general, the problem has been the lack of dependable supply and stable prices of natural resources. The country is now facing the prospect of large-scale industrial restructuring. If Korea continues to promote rapid export-oriented industrialization, the probabilities are that it will eventually experience similar difficulties.

On the other hand, according to Hong Korea has had the ability to pass the increased cost of imported raw materials on to its export prices. At the same time, however, the Korean wage level has gradually risen in recent years, and shifting the increased export prices will soon become nearly impossible. Also as a resource-poor nation Korean dependency on imported raw materials has been increasing sharply

during the period of rapid expansion. How, then, should Korea adapt to the new condition of increasing instability in raw materials trade?

It is very important for Korea to assume a positive role, as a resource-poor nation, in its relationship with its trading partners. Hong emphasizes that resource-rich countries, such as the U.S., Australia, and Canada, should avoid self-centered trade policies which exploit resource-poor developing countries. Other advanced nations should maintain their position as rational and dependable leaders of the free world by refraining from ultra-protectionist policies. Korea, on the other hand, should develop a viable trade policy toward resource-rich nations. At present, Korea is able to import natural resources from resource-rich nations while maintaining high levels of exports to the U.S. and Japan. But if Korea continues its high level of growth, it will have to depend, to a much higher degree, upon the supply of raw materials as well as upon its export markets. Accordingly, Korea must consider not only the resource-rich advanced countries, but also the resource-rich developing countries.

To support my argument, I emphasize two aspects of Japanese resource trade. Imports of primary goods in Japan consist of several types. The country must depend on Australia for 13 primary goods, Canada for 8, and the United States for 7. On the other hand, Japan depends on mineral resources and crude oil from Southeast Asian and Middle Eastern countries. Southeast Asia exports nearly all of their resources to the Japanese market. Accordingly, there are two distinctly separate trade policies in Japan. One is the policy based on the principles of free trade toward resource-rich advanced countries, and the other is based on the non-beggar-thy-neighbor trade policy toward resource-rich developing nations.

Korea will soon face the same situation as Japan. The question is what would be the best strategy for a resource-poor developing nation in negotiating with resource-rich or resource-poor developed countries or resource-rich developing countries. The answer to this question, in my opinion, lies in the diversification of trade markets for Korea.

NATURAL RESOURCE PROBLEMS IN A RESOURCE-POOR DEVELOPING COUNTRY:

THE KOREAN CASE

GENERAL DISCUSSION

As a small economy, Korea has little impact on aggregate trade in minerals, and recognizing this, has decided not to fight reality. There is some implication in the paper that no resource policy is needed, as the market will solve everything. So long as resources are only partly politicized, having a small share in demand is probably a good thing -- but if the markets become highly politicized, possessing a larger share would be more advantageous.

However, from a more cosmic viewpoint, it was observed that possessions are a curse, and it may be better to be resource-poor than resource-rich (at least beyond one's own needs or capacity to develop). In the long run the consuming nations probably have more control over resource development than the producing countries. Moreover, human capital in addition to mineral resources, might be an inflation hedge in its capacity to create new techniques adapted to changing factor availability.

The question of whether a small country is better off in spot markets or long-term contracts was raised, as well as whether such countries have sufficient access to information to know if they are dealing on reasonable terms. Korea buys most of its raw materials under medium-term (3-5 yr.) contracts from diverse sources. It was pointed out that price volatility causes spot markets to be very risky, so most manufacturing firms prefer contracts. The relative price certainty also has advantages where exchange controls mean dealing with government bureaucrats to obtain foreign funds as more long-range planning is possible.

Korea's rapid growth, together with that of other Asian countries, means that while singly their impact on resource trade may be small, in 15 years they will represent, in the aggregate, demand

comparable to Japan's today.

Korea has, at times, been lucky and resourceful: in 1974, faced with worldwide inflation and disrupted markets, it expanded output and paid for its higher-priced energy and other imported inputs with real resources, aiming particularly at the Middle East. As a result, while totally dependent on that region's oil, Korea has a positive trade balance with the oil-producing countries.

Korea also gained an edge by devaluing its currency before Taiwan, its principal competitor, did. Recognizing itself as a price-taker in world markets, through internal structural changes and price adjustments, the price increases of imports were passed through to Korea's own consumers.

Domestic inflationary pressures have not been handled as well as they might have been and the recent trade surplus has had an especially strong impact on the domestic money supply. It was suggested that the paper ought to consider other factors which caused Korea's inflation other than increased raw material prices. Import tariffs have not been reduced as quickly or as much as they should have been, given Korea's trade surplus. There has been very tight control of trade and capital markets in Korean development.

In Korea's development, many items were first produced principally for export and then were sold at home as the domestic economy grew, and consumers became more affluent. This has been a good strategy.

Economic growth has been rapid in part because of changing export composition. Policy measures such as product diversity have been used to achieve this in addition to the obvious export-promotion schemes. In the early 1960s entrepreneurs got rich on labor-intensive exports. The government's control of loanable funds meant that many firms switched to heavier industries when the decision was made to develop them. Thus the entrepreneurs have a very broad outlook, rather than each being tied to a few products.

Not all government planning decisions have been rational, and one current project in particular seems, ex ante, marginal at best: the

decision to expand zinc, copper, and lead production. It was suggested that Korea may end up with inefficient nonferrous capacity as Japan did, and have a vested interest in maintaining it.

The issues involved in trade in world minerals include restricted accessibility by producers (which has been done with food), and relative prices and the terms of trade -- but these are within the context of total trade. The nature of the special problems faced by resource-poor developing countries is not made very clear.

****III. POLITICAL ECONOMY OF MINERAL RESOURCES: POLICY ALTERNATIVES****

Commodity Trade from a North-South Perspective

Jose Pinera

Discussants: Seiji Naya
Norman I. Robins

General Discussion

Japan's Resource Security and Foreign Investment in the Pacific: A Case Study of Bilateral Devices Between Advanced Countries

Kiyoshi Kojima

Discussants: Michael Keran
Kuo-shu Liang

General Discussion

The Wider Context of Bilateral Resource Exploitation Arrangements Between the LDCs and the DCs

Miguel Wionczek

Discussants: Romeo Bautista
H. Edward English

General Discussion

International Commodity Control: The Tin Experience

Mohamed K. M. Ariff

Discussants: Laurence L. C. Chau
Kenji Takeuchi
Sirman Widiatmo

General Discussion

An Organization for Pacific Trade, Aid and Development: Regional Arrangements and the Resource Trade

Peter Drysdale

Discussants: Saburo Okita
Seiji Naya
Hugh Patrick

General Discussion

COMMODITY TRADE FROM A NORTH-SOUTH PERSPECTIVE*

Jose Pinera

Commodity trade is an important component of international economic relations. It represents around 35 percent of world trade and is the source of 80 to 85 percent of less developed countries (LDCs) export earnings. Trade in commodities can be conducted under different "rules of the game" -- or trade regimes -- which will entail various degrees of accomplishment of the several goals of an international economic order: efficiency, income redistribution both among and within countries, stability and economic security. Thus we will trace out the consequences, in terms of these goals, of four broad categories of commodity trade arrangements: free markets, cartelized markets, controlled markets, and a fourth "preferred" regime

1. The Free Market Regime

This regime is the one that most closely resembles the conditions of today's commodity trade. In fact, until 1973 most commodity trade was conducted in markets that were called free in the sense that they were not subject to major direct governmental intervention. With the exception of oil trade that is now conducted in cartelized markets and other commodities subject to mild interventions (tin, coffee), free markets continue to be the dominant form of organization of commodity trade.

*This paper is part of a research project on commodity trade that I am conducting for the 1980s Project on the Council for Foreign Relations. I would like to acknowledge very useful comments by the Project staff and collaborators, and by Professors Lawrence Krause and P. N. Rosenstein-Rodan.

We will first discuss to what extent an ideal system of competitive markets will achieve the goals of the international economic order. Then we will contend that the present markets are, in fact, quite far from these ideal conditions. We will point out the main imperfections of these markets and trace their consequences in goal-accomplishment.

Competitive Free Markets

The theoretical literature has dealt extensively with the optimality characteristics of a system of competitive (atomistic competition, absence of externalities, absence of market power, etc.) and complete markets. The most important conclusion refers to the proposition that such a system will allocate scarce world resources in the most efficient way and lead to a Pareto optimal situation, that is one in which no one can be made better off without making someone worse off. The existence of a full set of futures markets, perfect information, and stabilizing arbitrage and speculation would minimize (not necessarily eliminate) price fluctuations around the long-term price trend and thus instability in spot markets.

In the case of exhaustible resources,¹ the intertemporal optimality of market allocations requires, moreover, that the market discount future profits at the same rate as society would wish to discount the welfare of future inhabitants. Otherwise, if private discount rates are systematically higher than the correct social rate of discount, resources will be exploited too fast and exhausted too soon. Moreover, an optimal competitive market solution requires the absence of myopic decisionmaking. Some agent must always be taking the long view and be willing to arbitrage between present and future in ways that will push the current price toward the "right" long-term path. Otherwise the efficiency conditions will not be fulfilled and, moreover, instability will be heightened if the economic agents concentrate too heavily on spot or flow decisions and not enough on future or stock decisions.

These considerations emphasize the need for adequate information about reserves, technology, cost and demand conditions, not only in the

present but also in the future.

The distributive impact of an ideal competitive market, both among and within nations, will depend on the original distribution of property rights over resources and on the prices that those resources command in the market. In the case of exhaustible resources, those competitive prices will include a scarcity rent for the owner of the resource deposit. Therefore, there is no presumption whatsoever that the market-determined distribution of the gains from commodity trade will accrue to individuals and nations according to a domestic or international social welfare function that indicates the desired distributive situation

For commodities traded in world markets, the terms of trade obtained in competitive markets will determine the distribution of the gains from trade among the trading nations. So the terms of trade play an important role in determining the relative share that each country obtains from trade. The terms of trade determined in a competitive trade equilibrium will lead to a Pareto optimal situation. However, an interesting feature of the trading system should be noted: in the presence of multiple Pareto optimal equilibria, a situation discussed by Marshall, many different terms of trade fulfill these conditions and imply an arbitrary division of the gains from trade.²

Market Distortions

At least two major departures from the conditions of competitive free markets that are crucial to the result of allocative and dynamic efficiency can be observed in today's commodity regime: major distortions created by government intervention and imperfect competition.

Developed countries place important barriers to commodity trade. These include protection of domestic producers of agricultural commodities, tariffs, quantitative restrictions, excise taxes, state trading monopolies, stockpiling policies and so on. These barriers create efficiency losses that reduce world real income vis-a-vis a situation without these distortions. They are usually justified in DCs by domestic distributive considerations (such as the program to

support agricultural prices). However, some of them, such as the import and excise taxes on non-competitive agricultural products coming from LDCs, resemble more an exploitation of monopoly power and thus provoke international redistributive transfers from exporter to importer nations ³

The non-competitive nature of several commodity markets has not been so readily acknowledged nor its efficiency and redistributive impacts duly assessed. Many mineral resources are controlled by a few, vertically integrated, transnational corporations (for example, bauxite and uranium). This, together with the fact that the demand for commodities is generally inelastic, creates the potential for non-competitive behavior in order to capture oligopsony-oligopoly rents. Besides the important redistributive effect of these actions, they create efficiency losses associated with non-competitive markets. Moreover, they tend to restrict production and investment below its optimum amount from a global welfare perspective.

Note that in the case of exhaustible resources, these non-competitive industry structures tend to "conserve" the scarce resource longer than a competitive market. If a competitive market solution coupled with lower social than private rates of time preference, tends to exhaust the resource too fast vis-a-vis the optimal rate of exploitation, the production restrictions created by the oligopolistic market slow down the rate of exploitation. If it does not restrict production below the optimal level, it clearly generates efficiency gains.

Stability is not a feature of today's commodity markets. Rather they are subject to wide price fluctuations as a result of demand and supply shifts in the presence of low short run elasticities of demand and supply. Price fluctuations originating in demand shifts -- a common case in minerals -- destabilize export earnings more than if they originate in supply shifts.

Private arbitrage and speculation have been unable to reduce these price fluctuations to manageable size. Furthermore, there is the possibility that private speculation, if based too much on flow rather

than stock indications, may even be destabilizing. Private buffering activity, limited to storable commodities, is influenced by storage costs, information costs and interest rates. Social values may well be below private values for these variables in the presence of indivisibilities, externalities, etc., and, if so, social gains will exceed private gains from buffering activity. Moreover, it has been suggested that private price stabilizing activity is depressed due to the likelihood that governments will intervene when prices are unusually high, preventing the private holder from capturing the full value of maintained stocks.⁴

In a very interesting paper, J.M. Keynes addressed this problem as follows:⁵

"It is an outstanding fault of the competitive system that there is not sufficient incentive to the individual enterprise to store surplus stocks of materials beyond the normal resources required to maintain continuity of output...which should be no matter for surprise because the competitive system is in its ideal form the perfect mechanism for ensuring the quickest, but at the same time the most ruthless, adjustment of supply and demand to any change in conditions, however transitory. It is inherently opposed to security and stability, though, for the same reason, it has the great virtue of being also opposed to stability in the sense of stagnation."

Price fluctuations allocate the existing supply in the short run through a price mechanism, but complicate the investment, production and consumption processes related to the commodity and sometimes even induce the wrong responses. To some extent, producers and consumers may insulate themselves by appropriate inventory accumulation and depletion and hedging in forward markets.

Note in this respect that vertically-integrated firms operating in commodity production may well reduce price fluctuations as a result of price-fixing arrangements and allocation rules.

The main concern with instability in commodity trade has not been the impact on private producers or consumers but on the foreign exchange availabilities of those countries whose export receipts from one or two commodities account for an important proportion of their

total export earnings.⁶

Southern countries are the most vulnerable in this respect.⁷ These countries find it very difficult to cope with fluctuations of export earnings through the holding of a large amount of costly international reserves. They cannot afford to rely solely on short-term borrowing in international capital markets to cover the large export earnings shortfalls. Possibly they will have to pay expensive interest rate premiums to compensate for their deteriorated creditworthiness position as a result of their extremely weak bargaining position in such eventualities. Multilateral financing through the compensatory facility of the IMF may ease the burden somewhat but the amounts are generally insufficient and the conditions too stringent.

Even though there are views to the contrary, there is enough evidence suggesting that export instability creates substantial damage to the developing countries economies by disrupting the flow of imports essential both to the investment (capital goods) and production (non-competitive inputs) process. Moreover it greatly complicates both private and public planning, interferes with sound trade and exchange policies and, given the widespread price rigidities present in LDC's economies, may even exacerbate inflation. Furthermore, export -- and thus economic -- instability in certain countries creates serious social and political disruptions.

The North-South redistributive impact, if any, of alternative commodity regimes will depend on whether Southern or Northern nations are the main commodity exporters and importers of those commodities subject to a given trade regime.

It is generally acknowledged that, in fact, Northern nations are the main, although by no means the only, importers of commodities.⁸ On the other hand, LDC's are the main exporters of some minerals such as tin, bauxite, manganese and copper. So, even though no general statement can be made asserting that Southern nations are the dominant exporters of all minerals, there are large asymmetries in the export share of South and North nations in some of these commodities.⁹

Therefore, in those commodities exported mainly by the South and

imported mainly by the North, the terms of trade will be an important determinant of the North-South income distribution situation given the weight of commodity trade in North-South economic interaction.

Today's regime, in contrast to a purely competitive situation, may tend to bias the terms of trade against Southern exports. The oligopolistic, vertically integrated transnational firms that operate in commodity production and distribution have the market power to depress the prices received by producer nations in order to capture oligopolistic rents.¹⁰ Informat on technology also allows these firms to capture quasi-rents in the marketing and distribution processes. Transfer pricing practices exacerbate the loss to exporter countries by tax evasion. Moreover, some governments of importer countries exercise monopsony power by imposing import and excise taxes on commodities facing inelastic demand, increasing the prices paid by consumers and lowering those received by producers

So today's regime does not seem to be neutral with regard to the competitive solution but rather entails redistributive transfers from Southern exporters to Northern importer nations. It may also involve, of course, transfers from Northern exporters to importer nations but, since transnational companies are owned by citizens of the North, they remain transfers within the North.

The free market approach does not accept the idea of accomplishing redistributive transfers through commodity trade. Rather it reaffirms that if there is any need for changing the world distribution of income, it should be done by direct financial transfers, even if the viability of such flows seems to be jeopardized.

In the midst of real or perceived resource scarcity, and supply interruptions threats, importer countries would like to have guaranteed and reliable access to raw materials to enhance their economic security. Otherwise, they would have to incur costly policies to insulate themselves from the threat of supply interruptions and embargoes, policies that range from stockpiling of raw materials to drastic decoupling measures designed to relieve the DCs from undue dependence on mineral imports.¹¹

Today's regime lacks export control rules and mechanisms to insure access to resources and thus heightens instability. Importer

countries are following a two track policy developing costly domestic substitutes and at the same time emphasizing the need for investment in resource production in exporter countries, thus making more unlikely the possibility of supply interruptions.

2. Price Raising Schemes

Southern commodity exporters do not accept as fair or legitimate the present distribution of the world income. If these nations consider as unfeasible the possibility of North-South income transfers through other mechanisms in the international economy, they may turn to commodity trade as a transfer channel.¹²

Redistributive transfers can be accomplished through changing the terms of trade in commodity trade. The exporter countries can increase commodity prices to the competitive levels (in the case in which original prices were below competitive levels as a result of oligopolistic markets) or above the competitive levels (when they exploit their actual or potential monopoly power). They should do so only when it is possible to do it without reducing exports to such an extent as to make this action prejudicial to their own interests.

The emphasis in exporter country demands has been on raising prices as if the original prices were in fact competitive; thus, export restriction has been a fundamental goal. The important, yet almost ignored, possibility of raising producers' prices and simultaneously increasing exports, an action that is possible when the original prices are below competitive levels, will be discussed in the section devoted to the preferred regime.

Both the cartel and the redistributive commodity agreement (as opposed to the stabilization commodity agreement) will aim at transferring real resources from importer to exporter nations through monopolistic pricing of primary commodities brought about by some form of price-raising scheme (PRS). They will differ in that the cartel is an attempt by the exporting countries to implement PRS unilaterally. This will possibly lead to higher price increases and the emergence of a confrontation atmosphere. The redistributive commodity agreement is

an attempt to convince importer countries to collaborate with exporter nations to devise and implement jointly a PRS, an analysis that will be valid both for cartels and redistributive commodity agreements¹³

The theory of international trade demonstrated long ago that a country can increase its real income by imposing, in the absence of retaliation, an "optimum" tariff on its exports when it has some degree of monopoly power in international trade.

In today's politically fragmented world, no nation controls the whole supply of a given resource but, by geographical accident, a few nations do control a large proportion of world exports in certain commodities. This export concentration creates the possibility of collusive arrangements to implement PRS.

The exercise of monopoly power in the commodity market will produce a result equivalent to the imposition of an excise tax on that commodity in the sense that a wedge will be introduced between consumer price and marginal cost, thus producing an efficiency cost (similar to the excess burden of an excise tax or to the welfare loss from monopoly)¹⁴ to the world as a whole but also a transfer of real resources from one group of countries to another.¹⁵

There are two basic prerequisites for a PRS: first restriction of exports must be beneficial to the exporting nations; second, these nations must be able to bring about this export restriction.

Beneficial Export Restriction

If the exporting countries aim to maximize foreign exchange earnings, a given percentage of export reduction will increase prices in a higher percentage, and thus earnings, only if the (excess) demand facing them is inelastic (a price elasticity lower than one).

The condition is less difficult to meet if the exporting countries aim to maximize real income gains, since in this case we must add as a benefit the value of the resources liberated by the restriction on production.¹⁶ The excess demand may be elastic, implying that foreign exchange earnings fall, and yet the country experiences a real income gain.¹⁷

The elasticity of this excess demand is a function of three

crucial parameters: the elasticity of world demand for the commodity, the supply elasticity of non-member countries and the share of world production controlled by the members of the PRS. In the short-run, demand elasticities for many of the commodities exported mainly by the South are lower than one.

A few Southern producers control a substantial share of world production and much larger share of world exports. However, in many commodities this share is not large enough if the PRS is restricted to LDC exporters. It is not unlikely that, in some commodities, important DC exporters such as Canada, Australia and South Africa may, if not actively join, at least tacitly follow policies consistent with those of a PRS (production restriction, etc.) thus benefitting themselves as large commodity exporters. Note that what is important is not the share controlled by the explicit members of the PRS but the total share composed by the PRS members plus those countries that follow policies similar to those of the PRS but do not join formally the PRS for non-economic reasons. We will assume hereafter that the PRS includes only Southern nations.

The supply elasticity of minerals of non-member countries may also be quite low since known reserves limit possible entrants, even though this elasticity may be higher in those DCs that can re-open old mines.¹⁸

The massive investments necessary to develop new reserves will not be so easily forthcoming if these new deposits are profitable at the high monopolistic price but unprofitable at the competitive price. Since the price that makes them profitable is not a result of structural changes in supply and demand conditions but rather a policy action by the PRS members, reversible if need be, the usual supply elasticity estimates may not be relevant since they would overestimate supply response. Uncertainty of expected returns may hold back non-member country investors, unless guaranteed by their government a fixed market or a minimum price irrespective of the future development on the PRS price.

Long-run elasticities, both of demand and supply, are generally higher than short-run ones. This means that the optimum PRS price may,

after the initial increase over the competitive one, decrease with time. However, even if the price at a future date goes down to a level that is lower than the one that would have prevailed if the PRS had not existed, the PRS option may still be a preferred one for the exporting nations. It will depend crucially on the rate of discount that the exporting nations apply to future income. Exporting nations try to maximize the present value of a stream of commodity earnings (or profits); if the rate of discount is very high, a strategy emphasizing short-term gains at the expense of long-term prospects may be a rational choice.

A fully optimal commodity PRS should ensure that the export quantity of each product consistent with the optimum price is produced by the South at the minimum cost in domestic resources. A PRS that utilizes an export tax to create the wedge between the consumer price and the marginal cost and to allocate the production shares among Southern producers, will establish a uniform world producer (marginal cost) price and a higher world consumer price.

The key requirement for having production efficiency with such a scheme, once the uniform producer price is obtained, is that of separating the price or revenue received by the exporting country from that received by the individual producer. This can be done by not relating in any way the domestic distribution of the monopoly gains obtained from the cartel to the output decisions of the individual producers. In this way there will be no overproduction since the individual producer will equalize its marginal cost of production to the price net of tariff, thus producing the quantity consistent with the world demand price.

Now, if every exporting country imposes its own taxes and subsidies on the export of this commodity, the uniform world producer price will not entail a minimum resource cost of producing this commodity since each individual producer will equalize the world producer price with its private marginal cost (including taxes or subsidies). However, a cartel that utilizes a global quota to create the wedge between the consumer price and the marginal cost and allocates production within the South by quota shares will not minimize

the resource cost of producing the global quota since presumably the marginal cost of generating additional output will differ among producers unless the quota shares are marketable and there is a competitive market among Southern producers.

Potential for Export Restriction

The intra-nation distributive impact of the PRS in each Southern nation will determine whether it is politically feasible to bring about an export restriction that, even though it may increase national welfare, will surely not entail equal gains for the different pressure groups in that country. The distributive impact will depend crucially on how the contraction of production is brought about. If it is done by imposing an export tax thus lowering the producer's price so as to discourage production, the government tax revenue will be larger than the international resource transfer, since it will include part of the original producer's surplus, while the loss in producer's surplus on the contraction of production will not reduce the tax revenue; only in the case of constant costs will the South's tax revenue equal the resource transfer. Since the tax revenue enters the budget, the final distribution of the gains from the PRS will depend on the distributive incidence of the government's budget.

If the contraction of production is obtained by allocating domestic quotas, the producers will receive the resource transfer as a windfall which could be taxed away partially or totally by the government. In this case, the gains distribution, prior to any government taxation will affect the income distribution situation in each country depending on the production characteristics of the commodity, whether it is labor-intensive or not, foreign or domestically owned, etc. Generally resource-based commodities will be produced by large firms, either foreign-owned or government-owned, since economies of scale may be important.

It is important to point out that even though on production efficiency grounds an export tax is superior to a quota, distributive considerations within the exporting country may render an export tax

unfeasible. In fact, the producer's price consistent with a high export tax may be so low as to entail producer's incomes below subsistence levels; so, it may not be desirable or feasible to limit production in this way and export quotas can be preferred. Note that the producer's price will be even lower than the equilibrium price in the absence of the price-raising scheme. Thus, a PRS implemented through an export tax is likely to find resistance among the producers since their income will be reduced, unless compensated by the government with lump-sum transfers unrelated to production levels (as opposed to higher prices that would encourage production); this centralized compensatory mechanism may be very difficult to operate in a less developed country.

Benefit Sharing among Southern nations is a very important issue affecting the probability of agreement to bring about a concerted export restriction. We must distinguish between benefit-sharing among the nations that are exporters of the commodity, a problem that will affect the feasibility and stability of the PRS, and benefit-sharing among all Southern nations, an ethical and political problem but not directly related to the implementation of a PRS in a given commodity.

The benefits of a PRS, when an export tax is used, would be shared according to the relative efficiency of the individual producers of each country. The more (less) favored will be those countries with the lowest-cost (highest-cost) producers that will increase (decrease) their share in the market. If the participant exporting countries do not agree in sharing the benefits according to production efficiency, but on efficiency grounds prefer to use an export tax to restrict production, a system of compensatory payments is required. If the equity criterion is to distribute the gains according to the initial market share of each country, while actual production shares change according to production efficiency, side-payments will be required from the lowest-cost to the highest-cost producer countries. Alternatively, the criterion could entail using the PRS gains to improve the relative position of the poorer countries among the producing countries; in this case, the need for and direction of side-payments will depend on the relation between efficient production and

level of income per capita, and may require more substantial side-payments if the lowest-cost producers are also those countries with the higher level of income per capita.

Side-payments among the exporting nations may be an unfeasible compensatory mechanism. In this case, a norm for the distribution of the PRS gains among the participant countries can be incorporated automatically into the agreement by using export quotas, instead of a uniform export tax, to restrict production. Quotas can be used without losing production efficiency, and thus decreasing the magnitude of the gains to be distributed, by giving the participant countries marketable export quota rights.²⁰ The export rights, required in order to export the commodity and adding to the exports consistent with the higher world price, are allocated among the countries according to the agreed equity criterion. For instance, they can be given to each country in proportion to their initial market shares (keeping the status-quo criterion) or according to this share but with certain adjustments so as to allow an increase in the shares of new producers. In this way, both the low-cost countries will be on the buyer side and the high-cost countries on the seller side; the compensatory payments are accomplished, in an implicit way, through a market operation.

Whatever the compensatory mechanisms, it should be realized that there are several complications that render very difficult the definition of the "fair" share of each participant country in the distribution of the PRS gains. Thus, for instance, second-order impacts will have to be assessed whenever the commodity is an input in the production of goods or services that are imported by the participants; the relevance of these feedback effects to benefit-sharing will depend on the importance of this input to those product costs and the relative asymmetry in imports of these products by the participant countries. In a dynamic context, different rates of time preference among the participant countries will lead to different desired patterns of benefits (and thus production levels) over time. So, if the urgency for obtaining additional resources for investment or consumption is correlated with some measure of welfare, like income per capita, it would seem that the stability of a PRS will be higher when

the participant countries have a similar degree of development.

Moreover, relatively new producers will challenge any proposal to distribute gains according to some status quo rule, and so a "fair" benefit-sharing "path" will have to be defined to accomodate these countries. Note that a dynamic version of the optimum tax rate -- according to which growth in the exporting countries shifts their export supply curve to the right over time and assuming a low income elasticity of demand (so that it does not shift to the right over time) -- will entail an increasing optimum tax rate since the price elasticity of the demand for exports will decline as one moves down the curve.²¹

Apart from the problem of benefit-sharing among the PRS-participants, there is the fact that the ability to produce commodities with potential monopoly power is unevenly distributed among Southern nations and, of course, with no correlation to the level of income per capita. So, a PRS in a certain commodity by a subset of Southern nations will, unless the rest of the Southern nations are not net importers of this commodity or of goods in which this commodity is an important input, provoke income transfers within the South that may be regressive, that is, from low-income Southern nations to high-income Southern nations.

These intra-South reverse redistributive transfers probably do not affect directly the feasibility of the PRS unless, in the case of a PRS brought about by a cartel, the political support of all Southern nations is required either to avoid stronger retaliatory actions by the North or to prevent the possibility of the importing Southern nations joining the North in attempting to create a countervailing monopsony power. However, the existence of this situation may introduce destabilizing forces inside the cartel so long as there is no consensus among the participants on the desirability of avoiding these intra-south reverse transfers and on the mechanisms to prevent them from taking place.

Two mechanisms to prevent this situation are: (a) two (or multiple) part pricing, that is, price discrimination among the consumers according to their per capita income level, provided

effective barriers to reexportation can be imposed, and (b) refund of the reverse transfer implicit in the higher price of the commodity by lump-sum payments. If these payments take the form of softloans, only the grant component of them constitutes the effective refund. Note that both these mechanisms will only prevent the first-order transfer, that is, the cartelized commodity higher import bill but not the second-order transfer implicit in the higher prices of other imports; if the commodity is an important cost element in some processed goods, due to the increased price of the cartelized commodity. To estimate this second-order effect is a difficult task due to the imperfections that may exist in the markets of these other goods.

3. The Cartel Regime

Southern exporters controlling a substantial share of world exports of a given commodity may be able to join and form a cohesive group possessing some degree of monopoly power in the world trade of this commodity.²² As already discussed, they must be able to agree on the necessary measures to restrict exports and distribute the monopoly profit among themselves.²³ The real resource transfer thus generated from Northern (and from Southern) importers will obviously not constitute an aid-transfer by the North since it will not be a voluntary transfer. However, Southern nations must be aware that the North can adopt countervailing policies designed to prevent the cartels success and minimize the damage to the North's economies.

North's Countervailing Policies Within the Commodity Area

When the South's commodity cartel generates such gains to the South and such losses to the North that the resulting real income levels of both blocs are not acceptable to the North, then the North will try to adopt countervailing policies designed to improve its welfare. We may distinguish between countervailing policies in the short-run, and in the long-run.

In the short run the North has a limited capacity to adjust its production and consumption structure to the new relative prices, even

though losses as a result of the commodity cartel can be, under certain circumstances, somewhat reduced by stockpiling, recycling processes and conservation measures. However, the North may try to improve its position by retaliatory measures. These measures must be such as to increase the expected value of the North's real income. We are not considering, then, retaliatory measures that entail a reduction in the North's real income beyond the one provoked by the cartel and that are undertaken with the purpose of inflicting damage on the South; this behavior may be possible in a framework emphasizing power relations, since they depend on relative, and not absolute, income levels.

The case when retaliation takes the form of the imposition by the North of an optimum tariff, on the assumption that the South's tariff will remain unchanged, has already been analyzed by Johnson.²⁴ He proved that a country may gain by imposing an optimum tariff even if other countries retaliate by following the same policy and it has investigated the conditions under which it will gain for a group of special cases. So, the mere possibility of tariff retaliation by the North will not necessarily induce the South to abstain from operating a commodity cartel. This analysis assumes, of course, that the Northern nations are able to exercise a monopoly-monopsony power of their own beyond that which was being exercised anyway; this may prove to be difficult for the same reasons that apply to the formation of commodity cartels, especially given the dispersion of manufactured goods producers.

The North may also respond in the short run, trying to bribe the South into dismantling the cartel, if costless lump-sum payments can be accomplished. Since free trade is Pareto optimal for the world as a whole, the North may pay the South a bribe and still be better off, by the whole gain in world real income originating in the return to free trade, but the South may share in this gain. Note that the South, when it accepts a bribe for not imposing the optimum tariff, may even be better off than with the optimum tariff, depending on whether its bargaining power is such as to be able to elicit a bribe higher than the real income loss that will entail moving from an optimum tariff

equilibrium to a free trade equilibrium. However, if the North can only obtain tax revenue by incurring some deadweight loss, it is not certain that it can bribe the South and still be better off; the classical postulate continues to hold when the deadweight loss associated with securing bribes is smaller than the efficiency cost incurred by the world economy when the South imposes an optimum tariff.

The above analysis refers to attempts by the North to retaliate against the cartel as a whole. However, it may be more convenient, if possible, for the North to pursue a discriminatory retaliation policy, focusing its countervailing policies on the weaker in the sense of less committed, participant nations composing the cartel. Because of economic as well as political reasons, the payoff from partially breaking the cartel is (a) not uniform among the participant countries since their production costs and rates of time preference are different, and (b) very high, since large gains will accrue to an individual country by not restricting production to the stipulated amounts. So, discriminatory tariffs or bribes by the North may render largely ineffective a commodity cartel, unless the degree of cohesion among the participants is very strong.

In the medium and long run, the North's flexibility of response is heightened and the space of feasible policies is enlarged. Thus, the North may undertake efforts to change dramatically its structure of production and consumption by accelerating the search for substitutes and new sources of production. As discussed, commodity cartels are restricted to commodities in which the South has, at least potentially, a certain degree of monopoly power, and we have emphasized the crucial role of the elasticity of demand in determining the feasibility of cartels. The strength of substitutability relations between commodities will largely determine their price elasticity of demand. The South, however, may neutralize to some extent the competition by some substitutes if able to form "super-cartels," that is, joint cartels of commodities that are substitutes, or are important inputs of substitutes, and that are exported largely by the South. In this case, a super-cartel can be devised so as to maximize the joint gain in real income. The problem of benefit-sharing will arise, and it may be even

more difficult to agree on fair shares in the case of more than one commodity, partly from the fact that the viability of the cartel is inversely correlated to the number of participants.

The absence of synthetics or other substitutes to a given commodity will generally entail a low price elasticity of demand. However, this situation should not be regarded as exogenous in considering cartels, since the emergence of new substitutes is, at least partly dependent on the amounts of resources devoted to research in synthetics and new production processes; and more resources would be allocated to research the higher its expected profitability. That is clearly dependent on the prices that the cartelized commodities command in the market.

The search for new sources of minerals is conceptually equivalent to the search for substitutes.²⁵ Advances in technology may allow very soon the commercial mining of sea-bed resources, allegedly containing in the so-called manganese nodules minerals such as nickel, copper, cobalt and manganese.²⁶ This action may worsen the terms of trade for some less developed countries.

Whenever multinational corporations operating in the South are engaged in the production and marketing of a commodity susceptible of being cartelized it may be convenient both for the governments of the host countries and the companies to ally themselves in the pursuit of higher profits that can be distributed between them. The companies may obtain an insurance against total expropriation and the government may use, not only the technological, managerial and marketing know-how of these companies, but also their transnational character, thus making the collusion among the exporting countries easier. The role of multinationals engaged in commodity production may be, if they choose or are driven to ally themselves with the exporting countries, not only one of "tax collectors" for the exporting nations,²⁷ but also one of increasing the viability of commodity cartels. They will perform an even more essential role if super-cartels are intended.²⁸

Those directly affected within the North will be the consumers, but their loss in real income will be spread among a large number of

individuals compared to the gain accruing to a few multinational companies; the capacity of the North's governments to react strongly in the face of commodity cartels will be compromised by two domestic forces pressuring in opposite directions. The South will exchange part of the real income gain for a powerful ally that will enhance the viability and stability of the cartel. However, the cartel will probably have a regressive distributive impact within the North while transferring, at the same time, income from the North to the South.

Although there are indications - not conclusive empirical evidence -- that commodity cartels may transfer substantial amounts of resources from the Northern to the Southern nations, there are several opposing forces in operation that render their feasibility an open question. Moreover the possible regressive income transfers among Southern nations pose a disquieting ethical problem and a challenge to the solidarity of the commodity-rich nations. On purely technical grounds these transfers can be easily prevented from taking place. However, in the tense atmosphere in which cartels would prevail, two-part pricing to avoid these regressive transfers may be very unlikely since they will enhance the opportunities for breaking the cartel.

The Path Toward Confrontation

The cartel option may lead to events surpassing the pure redistributive nature of a price-raising cartel. Non-economic goals of Southern exporters, the North's countervailing policies, or even the political dynamic that may lead to irrational acts in either bloc may engage the South and the North in an unstable and unpredictable confrontation path.

Perhaps a crucial issue is whether the South or the North chooses not to restrict their actions to economic responses within the commodity trade area. The linkage of the commodity struggle to other economic areas or even to non-economic arenas contains the seeds of an explosive situation.

The South may adopt or threaten supply interruptions and embargoes to improve its bargaining position in other areas. Even more, the South may choose to discriminate among Northern nations in

price increases or supply embargoes. The North may respond, either to the original purely redistributive price-raising cartel or to the non-redistributive threats, exercising its power where it finds itself in a stronger position (food exports, market access, financial flows) in order to compensate the power asymmetry in the commodity or it may even go further and escalate the struggle to the political and military arenas. Such actions would trigger Southern responses that could comprise debt moratorium or even, as has been proposed, collective default by Southern nations in their debt stock, massive expropriation without compensation of direct foreign investment located in Southern nations, and so on.

The dangers and possible negative repercussions of such actions in the fabric of the world economic and political system are, of course, tremendous. Such possibilities would strengthen the position of those that propose a decoupling or disengagement of the North and the South.

Apart from rational concern over controlling interdependence in order to allow it to reach the optimum level at a certain trade-off between the economic gains of interdependence and the restrictions it places on national sovereignty and independence, there are advocates of drastic decoupling strategies both in the North and the South. Northern proponents argue that the North has much to lose from erratic Southern policies and little to gain from economic interaction with the South. They propose large-scale "Projects Independence" to make them self-sufficient in raw materials and a retreat to economic intercourse only within the industrialized world. They seldom make explicit calculations of the possible substantial economic cost of such autarchic measures nor do they discuss the implications of such a strategy on the attainment of such goals as world peace and a global society.

Radical Southern advocates generally emphasize political reasons and "dependence" theories to propose a "general disengagement from the international capitalist system" and regard the cartel option as a transitional strategy "to be employed in the interim period while exports to the Centre are being phased out and mineral production is

being oriented towards domestic use."²⁹ Such disengagement strategies would seriously compromise world efficiency to such an extent as to produce a joint loss situation

Summary Evaluation

The cartel regime may provoke especially in the short-run, substantial resource transfers to Southern commodity exporter nations. However, it may provoke non negligible regressive transfers from poor Southern importer nations to richer ones. It will involve world efficiency costs, but in a moderate and well designed price-raising cartel they may not be very large in view of the inelasticities of the system in the short run.

The real threat is the escalation of the conflict that retaliatory measures may provoke, especially if the conflict is not limited to the commodity arena but is extended to other areas. Such a confrontation scenario would heighten instability and would not fulfill the goal of economic security. Decoupling strategies will be too costly and will lead to a further fragmentation of the world.

4. The Commodity Agreements Regime

The dissatisfaction of Southern commodity exporters with the operation of the present market system has led them to advocate controlled forms of trade in raw materials through commodity agreements (CAs) with participation of both importer and exporter countries.

CAs have been associated with multiple objectives and this has confused the discussion of their merits and weaknesses.³⁰ We can distinguish, on the basis of their primary purpose, two main categories: redistributive CAs devised primarily to transfer real resources from DC importers to LDC exporters, and stabilization CAs designed to smoothen short-run price fluctuations around the long-run trend but without affecting this trend.³¹

It is very important to draw a clear line on whether any agreements -- especially buffer stocks -- will serve only a

stabilization goal or whether they would include redistributive elements (that is change the level of the long-run price trend). Their negotiation will be complicated and their chances of implementation reduced if they are meant not only to stabilize prices around the trend but also to provoke a disguised transfer from importing to exporting nations.

It should be borne in mind, however, that some of the proposals that are generally made for arrangements designed to stabilize either the foreign exchange earnings of LDCs or the prices of certain critical commodities include features that also produce a regular transfer of resources from DCs to LDCs.³²

The reduction of price instability may have mutual advantages for both importer and exporter countries, regardless of whether DCs or LDCs are subject to more export instability.³³ Since the several methods to stabilize export prices have been discussed at length elsewhere,³⁴ we will concentrate our analysis on redistributive CAs.

A redistributive CA can operate through a price-raising scheme (PRS), as discussed in the former section, in which both exporter and importer countries would sustain the mechanism to increase the price above the competitive level. It will include an "aid" component if there is a partial or absolute inability by the LDCs exporters to operate unilaterally an effective commodity PRS provoking a resource transfer to them from the DCs. The successful implementation and operation of the arrangement should require the agreement and collaboration of the developed importing nations. In certain commodities the North's explicit collaboration with Southern nations may be necessary for the exporting countries to keep prices above competitive levels through export restrictions. DCs can cooperate with LDCs by abstaining from retaliatory measures that could improve the DCs position. Also they can help LDCs in any phase in the process of reaching and operating a CA such as in the discussion stages as arbiter of conflicts, in the implementation stage, or in the enforcement stage providing the sanctions for misbehavior. If these actions generate a transfer of real resources from the former to the latter and DCs do not ask any direct economic compensation or

reciprocity for them, then this one-way transfer can be considered an aid-transfer. It should be noted that the magnitude of the aid-transfer in a CA is not necessarily equal to the total transfer that the agreement produces because the developing exporting nations, or at least some of them and for some time, could have obtained some fraction of the monopoly profit acting unilaterally.

There is a pervasive tendency in the discussion of CAs to attach intrinsic values (rationality, equity, etc.) to some commodity prices. LDCs claim that commodities should command "equitable prices," which mean higher prices than those prevailing in the market. DCs argue that raw materials should be available at "reasonable" prices, which mean lower prices than those obtainable by supply manipulation.

Once the possibility of multiple transfer channels is recognized, it is at the least misleading and at the most inadequate to attach equity connotations to commodity prices. This approach can be misleading because prices cannot be fixed independently of demand and supply conditions in the market of a given commodity and thus a mechanism should be specified to explain how the "equitable" or "reasonable" price is related to the prices that clear the market for different supply restrictions that can be imposed. And it can be inadequate because, apart from the fact that an equity criterion based on ethical grounds should be made explicit, equity has a more adequate meaning as a characteristic of the existing distribution of the world's income and wealth or of the outcome of the global transfer process rather than of the commodity price structure itself.

Thus it seems to me a clarifying approach to distinguish, within the category of market clearing prices, between competitive and non-competitive prices of primary commodities that are associated with different degrees of supply restrictions. If LDCs exporting primary commodities are able to secure by themselves non-competitive prices higher than the competitive ones and their real income is increased as a result of this action then they should do so in their own interests, unless bribed by the DCs to do otherwise, and, in a world divided in sovereign nation-states, the DCs should accept this as a legitimate economic option of the LDCs.³⁵

But if the LDCs are not able to exploit unilaterally their latent monopoly power and they need and obtain the collaboration of the DCs to impose non-competitive prices, then it is better to recognize this action for what it is, an "aid" operation, in order to be able to plan an informed and rational strategy for increasing their real income with due consideration to the reality of economic facts. The only argument for not recognizing explicitly the real nature of such an operation is that of political and bargaining convenience, so long as this disguised transfer is not perceived for what it is inside the transferor nation.

It should be noted that a basic characteristic of a PRS-CA arises from the fact that the price-quantity configuration reached through the scheme will be a point lying on the demand curve facing the exporting country. Thus, PRS-CA do not require explicit international subsidy payments and the consuming-transferor nations do not need to appropriate any fiscal revenue in order to implement the scheme. The resource transfer is being accomplished directly from the consuming units within the developed-importing nations to the authority collecting the "revenue" of the implicit excise tax. This authority could be the government of the less developed-exporting country or, if an international levy is imposed in the trade of the commodity, an international authority would become the recipient of the "revenue" in a first instance and later would transfer it partially or totally to the exporting countries. If the developed-consuming nations impose a tariff on the commodity imports, and later refund the tariff proceeds to the exporting nations, the transfer encompasses a fiscal dimension requiring what is essentially an explicit international transfer payment.

PRS commodity agreements must comply with all the prerequisites already outlined for an export restriction to be beneficial to the exporting countries. They are very difficult to operate since they require the consensus of two groups with opposing interests, the exporter and importer nations.

An International Subsidy Scheme is another type of CA that can be used as a device to transfer real resources from DCs to LDCs. These schemes have an intrinsic requirement for international transfer

payments. They can be operated through a price-fixing arrangement in which the DCs bind themselves to buy a given commodity at a price higher than the equilibrium or free market one. If there is no output contraction, there will be overproduction and the governments of the DCs will buy and accumulate stocks of the commodity, thus making explicit payments. They can also be operated through production subsidies such that the consumers' price is lower than the free trade price but the price received by the producer includes a direct subsidy paid by the DCs. In this case output is higher than the free market one, although there is no overproduction in the sense that the price-quantity configuration is a point on the demand curve. In both cases, the changes in resource allocation generate efficiency costs and the transfer operation is really a result of direct transfer payments rather than of a manipulated market outcome.

These schemes require then, appropriation of fiscal revenue by the DCs, with the increased efficiency cost that this will imply if tax revenue cannot be raised with neutral taxes. Moreover, they do not require any specific demand elasticity and can be operated in any commodity exported by the LDCs. Consequently, these international subsidy schemes conceptually belong more to the financial aid transfer channel, although entailing higher efficiency costs if they result in resource misallocations, than to the commodity arrangements transfer channel. Furthermore, even though these schemes are used in DCs to accomplish domestic income transfers, it is unlikely that they could be adopted in the international scene, especially the producer subsidy version. The financing of buffer stocks has been considered by the DCs, but more as a stabilization device than a resource transfer channel.

Summary Evaluation

Redistributive commodity agreements in those commodities susceptible of being cartelized may lead to a reasonable compromise among the exporter and importer countries in a price between the optimum monopolistic price and the competitive long-run marginal cost price. However, they involve protracted negotiation processes and the same goal can be obtained, probably with lower efficiency costs, by

direct grant aid. Both actions involve the willingness of DCs to produce an aid-transfer from the North to the South.

Stabilization commodity agreements may perform a more useful function. In any case, redistributive and stabilization features should be clearly distinguished in negotiating and implementing a CA.

The proposal of generalized commodity agreements will lead to a highly visible manipulation of markets whose attainment of goals will depend crucially on how technically well designed are the CAs -- a difficult task -- and on the political will of the DCs to redistribute income through this transfer channel.

5. Towards a Preferred Regime

The present distorted free market regime does not fulfill adequately the stability and redistributive goals and it involves inefficiencies when markets are not competitive. The cartelized regime may redistribute income but not necessarily always in the right direction and may lead to gross instability and to confrontation. The commodity agreement regime may produce non-negligible resource misallocation costs and will substitute impersonal nature of the market for highly protracted political negotiations.

However, these regimes contain elements or blocks of elements which, if integrated in a consistent way and added to new ones, could structure a superior regime.

It may be useful to make explicit some of my views which will permeate the perspective of the preferred regime.³⁶

A basic assumption is that there is general interest in the construction of a "moderate" international order. The North needs the South's cooperation to manage global interdependence without having to incur in the short run substantial costs of confrontation tactics or to insulate itself in the long-run from the possibility of these actions by reducing the degree, and the benefits, of international economic interaction. I believe that the option of actively joining in the construction of a moderate international order which includes, among other things, the reduction of perceived inequality in the world

distribution of income, is the best for the North even if it tries to maximize its own, but interdependent, welfare function.

The South cannot achieve its aim of a more equitable world order by imposing it on the North. Whatever power Southern nations may harness in the short run from their control of natural resources would be better employed as a weapon to negotiate rather than to impose new rules of the game in the international economy. The South's producer power is asymmetrical: it can provoke substantial damage to the North in the short run through supply interruptions, but it may not be able to assure, if used unilaterally, a superior position for itself in the long run. This results in a situation where the threat is stronger than the execution, and thus a scenario more suited to negotiation than to confrontation.

We live in a second (or n^{th}) best world. This originates an important methodological requirement. The benefits and costs of alternative raw materials regimes should be assessed with reference to the status quo numeraire instead of being compared to the non-existent, and maybe non-viable, ideal situation. Thus the conclusions will depend on the original nature of the commodity markets. So, for example, a movement from a strongly oligopsonistic toward a mildly oligopolistic market (or towards an imperfect commodity agreement) may entail a gain to world efficiency. If the latter situation is evaluated vis-a-vis a free-competitive-efficient market the conclusion will be different.

The non-Pareto optimal nature of the world economic order entails the existence of "slack" in the system, which, if ways are found to reduce it, could generate a variable-sum game or joint-gain situation with gains to all or, at least, gain to one party without damage to the others. A new commodity regime must be built on the basis of joint gain situations to both exporter and importer nations. The charity of nations would not lead toward stable situations.

In a situation in which multiple objectives are pursued and the available instruments are often exogenously constrained (institutionally politically, etc.), solutions that rigidly assign to each instrument the attainment of only one objective may be neither

feasible nor optimal. Thus, for example, the classical first best solution to any international distributive problem would be free trade and capital movements, coupled with the appropriate international lump-sum transfers. These unbounded lump-sum transfers do not exist, even though grant aid approximate such flows. However, grant aid is constrained by non-economic elements (protracted legislative appropriation within the North, etc.) and generates costs such as those associated with the welfare cost of taxation or expenditure-switching required to free those resources. The conclusion relevant to this paper is that commodity markets can usefully be organized with a view to fulfill, to some extent, the objectives of efficiency, equity, stability and security.³⁷

Changes Within the Existing Regime

Improvements can be made to the existing regime along the following lines:

(a) Reduce or eliminate those barriers to commodity trade imposed by the governments of importing countries. This is essentially a domestic political issue. Efforts to improve adjustment assistance and, in general, to create mechanisms to compensate those groups who lose with the reduction of trade barriers are steps in the right direction.

(b) Retain import taxes on commodities (or substitute international levies for them) and hand the proceeds to multilateral institutions, which would reimburse partially the exporter country and give some aid to other poor countries on the basis of per capita income.

(c) Strengthen private buffering activity by encouraging organized futures trading.³⁸ Futures contracts would have to be much longer-term than is usual in existing futures markets. Make greater use of long-term contracts as substitutes for missing futures markets. This activity may even be subsidized since information -- a crucial requirement for futures tradings -- has some public good characteristics and may not be available in optimal amounts.

(d) Improve and enlarge schemes for earnings stabilization.³⁹ Instead of intervening directly in the commodity market, have these schemes attempt, through the provision of compensatory financing, to stabilize overall export earnings.

Although these schemes could serve only stabilization purposes, they generally include features that produce an income transfer from the importers to the exporters. This entails transfers in direct proportion to the fluctuations in commodity earnings, a rather arbitrary basis for redistributive transfers.

(e) Eliminate the barriers to the exports of processed raw materials implicit in the phenomenon of tariff escalation, that is, nominal tariffs increasing with the degree of processing and having the effect of escalating effective protection. This would increase world efficiency and the benefits to exporting countries.⁴⁰

Changes Requiring a New Balance of Power

The analysis of the present regime and its alternatives lead me to prefer a regime in which commodity trade is conducted in competitive markets. Whenever the present market is characterized by a few, vertically integrated, oligopolist multinational firms, a movement toward competitive conditions will entail a gain in world efficiency (increased production and investment), an increase in the price received by exporting nations and a price reduction to consumers. Of course, the crucial question is whether in fact the present trade regime in those commodities important to world trade and to LDCs is characterized by such potential power and whether such power is actually abused. There are studies that demonstrate or suggest that this was the case in oil (with the "seven sisters" dominating oil production and trade) and uranium,⁴¹ and that it today is in bauxite,⁴² nickel, phosphates, and others.

Diaz-Alejandro has pointed out that "commodity trade under steady multilateral rules of the game, and in open and competitive markets, is a possible arena of economic interaction between LDCs and DCs offering arrangements that are economically efficient while maintaining desirable characteristics of unintrusiveness, reversibility and

decomposability. Historically such an arena has never existed. Northern countries just developed their LDCs sources of primary products under colonial or neocolonial circumstances, and throughout have manipulated rules of the game in international commodity markets mostly to suit their own needs..."⁴³

However, I would like to emphasize that such a system cannot be reached without a more symmetrical structure of power in commodity trade. Since today there is a power asymmetry between the few multinationals and the fragmented exporting countries, a prerequisite for a change may be the creation of producer associations that would increase their power to bargain for improving the markets. Since technical aspects of commodity production may preclude competition among many small firms -- or render it very inefficient -- a near competitive solution may be the result of bargaining between the large multinationals and the governments of the producer countries.

An objection to this strategy is that it encourages producer associations that may turn into cartels. My reading of the current events is that the question is not whether LDCs exporting a given commodity will try to unite in producer association, because they will inevitably do so (if only because of the OPEC example), but whether they will lean toward creating a cartel regime, with all the dangers already discussed, or whether they can be persuaded that they should not "execute the threat" (create cartels and be liable to success or failure) but rather use it to bargain for improved markets. Producers' associations may even help to stabilize prices in the short run.

These new rules of the game should include also a negotiated access-to-resources for access-to-market arrangement corresponding to the interest of the DCs for guaranteed access to supplies and the interest of the LDCs for improved access to markets of DCs for their manufactured exports.

In some commodities trade is now conducted in competitive markets. The "slack" provided by non-competitive markets does not exist. Higher incomes for LDC exporting nations will require prices above competitive levels unless lump sum transfers become viable. The best alternative for the few commodities which have inelastic demands

and are unimportant in the import bill or consumer budgets of DCs will be efficient, well designed, redistributive commodity agreements.⁴⁴ As discussed earlier, the best mechanism will be to impose an international levy on the commodity trade since it will minimize production inefficiencies and the tax collected can be allocated in a discretionary way (refunded to LDCs 'importers, reimburse only partially "rich" LDCs exporters, etc.). However, it must be pointed out they they are very difficult to operate in an efficient way and that, moreover, they are highly imperfect substitutes for direct lump-sum transfers by the North while requiring the same political will to redistribute income.

On the stabilization goal apart from the improvement in futures markets already mentioned, I think that generalized buffer stocks merit further study but it must be considered that they will involve resource costs to operate and that their operation will be complicated by the attempts to influence the long-term price trend. In some commodities with special production characteristics that make for cycles of shortages and over-production because of a lagged response to price fluctuations, the price fluctuations must be reduced, possibly with adequate buffer stocks. For the rest, I would prefer a drastic enlargement of earnings stabilization schemes (in the direction of the US proposal at the UN in 1975) together with mechanisms to facilitate LDCs access to short-run international financial markets in reasonable conditions.⁴⁵

6. Conclusion

Thus, I propose a movement toward more competitive markets in commodity trade through a balancing of the bargaining power of both the North and South (meaningful earnings stabilization schemes, mild international intervention to stabilize prices, and new rules to heighten economic security). But to be acceptable to Southern countries, this commodity regime should be complemented with a substantial increase in the volume of lump-sum transfers from rich to poor nations, maybe in the form of an escalated international income

tax.

I believe there is a commodity threat that, dependent upon the Northern response, may turn either into a cartel threat or even a cartel regime, or into a desire to change the rules of the economic game. These rules were agreed after WW II in Bretton Woods in a very different international scenario. The North should not react to this threat seeking decoupling strategies but rather should try to construct a meaningful "structure of cooperation"⁴⁶ that will have to involve all the areas of North-South economic interaction, especially commodity issues, and be responsive to both Southern and Northern aspirations.

Whatever power Southern nations may harness in the short run from their control of natural resources should be employed as a weapon to negotiate a new liberal and equitable international economic order.

FOOTNOTES

¹This discussion of exhaustible resources is based on Solow (1974).

²In trade theory, this situation is studied when discussing the stability conditions of the competitive solution; the classic presentation is in terms of the Marshallian "shoe-lace" diagram which depicts three equilibrium points, two of which are stable while one is unstable. See Marshall (1930).

³The nature, importance and efficiency impact of these barriers are described in Johnson (1967), pp. 84-94.

⁴See McCulloch (1975).

⁵See Keynes (1975), p. 312.

⁶A similar problem would exist if, for certain countries, imports of a given commodity represented a large proportion of total imports. This does not happen. Commodity imports, with the possible exception of oil, represent a small proportion of total imports of the importer countries.

⁷For the following developing countries, mineral exports account for more than 20 percent of total export earnings (main export commodity shown in parenthesis): Bolivia (tin), Chile (copper), Guyana (bauxite-alumina), Jamaica (bauxite-alumina), Jordan (phosphates), Mauritania (iron ore), Morocco (phosphates), Peru (copper), Sierra Leone (diamonds), Togo (phosphates), Tunisia (phosphates), Zaire (copper), Zambia (copper).

⁸At least four groups of nations can be identified within the North according to their degree of dependence on commodity imports: (a) Japan is highly, and increasingly, dependent on raw material imports; (b) the EEC is very dependent on oil and non-fuel mineral imports; (c) the USA is an important exporter of commodities (especially grains) but depends on imports for the supply of some critical commodities; (d) Canada, Australia and South Africa, though importers of some commodities, are important exporters of non-fuel minerals.

⁹It should be pointed out in this connection that for certain non-fuel minerals only three Northern nations (Canada, Australia and South Africa) represent a large share of Northern exports. Thus, the South plus these three nations represents a dominant export share in several other commodities.

¹⁰Of course the extent of the actual use of market power is an empirical question. Even though there is some evidence that will be given later, this point clearly merits further study.

¹¹See Cooper (1975).

¹²A pioneering study of Commodity Arrangements as a means of transferring resources to LDCs through monopoly-pricing is that of J. Pincus (1965).

¹³There are two studies devoted to the discussion of trade arrangements in primary products that are extremely useful in understanding the subject: G. Blau (1964) and H. Johnson (1967). For a pre-UNCTAD study of international commodity agreements, covering the period from the decade of the 1920's, when interest in multi-nation commodity schemes first became evident, through the Havana Charter of 1948, until late 1962, see L. Baranyai and J.C. Mills (1963). See also UNCTAD (1964), UNCTAD (1968), J.E. Meade (1964) and M.J. Hooft-Welvaars (1964).

¹⁴As A. Krueger (1974) has shown, competitive rent seeking leads to the operation of an economy inside its transformation curve. So, if South nations devote resources to compete for monopoly rents in commodity markets, additional deadweight losses in world real income will be generated.

¹⁵Of course, there are also redistributational consequences both within the exporter and importer countries which will be discussed later.

¹⁶Note that a horizon long enough to obtain value from the resources liberated by restriction on production is likely to lead to more elastic demand and alternative supply curves.

¹⁷The approach to resource transfers that focuses on maximizing foreign exchange earnings of the exporting countries is consistent with an objective of maximizing their income only when the social cost of the resources involved in the production of exportable commodities is zero.

¹⁸This last possibility was drawn to my attention by Anthony Scott.

¹⁹The PRS will also affect current versus future generation income distribution. However, even though this may be an important ethical issue, it has a minor effect on today's feasible political options. The PRS also changes income distribution within importing countries since it is similar to an indirect tax, probably regressively. The impact on the issue discussed is remote.

²⁰According to Mohamed Ariff, this was done for some time in Malaysia to restrict tin exports.

²¹This point was made by W.M. Corden (1965).

²²This is the case of the oil exporting countries united in OPEC. They have increased substantially their real income by what is essentially an exploitation of their monopoly power in oil supplies to the rest of the world. The crucial aspect determining their success so far has been the cohesiveness that they have achieved in reaching and implementing their price-quantity accords. However, it is outside the scope of this paper to analyze the case of oil

²³See Bergsten (1973) for a warning that the commodity cartel threat is "real." Also see Krasner (1974) and Bergsten (1974).

²⁴See Johnson (1953).

²⁵Besides compromising the stability of the cartel, this type of technological progress, although reducing the North's dependence on the South, may be detrimental to the world as a whole. On this see the interesting paper by A.O. Hirschman (1959).

²⁶See UNCTAD (1973), R. Branco (1973), H.L. Fabian (1973), as well as the paper by M. Gorham in these Proceedings.

²⁷See Adelman (1972-73).

²⁸Note that the multinational firm is an entity within the sovereign control of the importer country, and thus exposed to counter pressures.

²⁹See Girvan (1975).

³⁰An UNCTAD (1972) report lists fourteen objectives: "stable prices, remunerative and equitable prices, exports earnings, better balance between supply and demand, adequate supplies for consumers, increasing consumption of the commodity, development of productive resources, international trade, dealing with burdensome surpluses, employment and labor questions, international collaboration, marketing policies and access to markets, disposal of non-commercial stockpiles and negotiation of additional provisions "

³¹Of course, it may be quite difficult to distinguish these two elements in the price movements of some commodities

³²A recent proposal in the commodity arena is that of the Secretary General of UNCTAD who has proposed an "integrated" program for commodities according to which uniform principals will be negotiated to control commodity exports important to LDCs (See UNCTAD TB/B/C.1/189 and TD/B/C.1/184). The basic elements of the program are the establishment of international buffer stocks, the creation of an international fund to finance the buffer stock arrangement, an improvement of compensatory financing schemes to stabilize export earnings, the negotiation of long-run supply and purchase agreements between exporter and importer countries, and the elimination of tariff

escalation in DCs to allow an expansion of raw material processing activities in LDCs. What are new in the integrated program are not the individual elements of the plan but the links that are established between all those elements both on the technical level -- common buffer stock fund, complementation between buffer stocks and compensatory financing etc., -- and the political level negotiation of the basic principles of the program for all commodities and then implementation on a product-by-product basis. In my view, the crucial point in the agreement will be the price setting mechanism.

³³This latter issue has been very much discussed. See McBean (1968) and J.D. Coppock (1962). Note that even comparable instability generates higher costs to the economies of the South, given the rigidities of their adjustment processes and their difficulty to compensate them by holding adequate levels of international reserves.

³⁴See H.G. Johnson (1967).

³⁵This position also entails that LDCs should regard as legitimate -- even though not necessarily rational -- the efforts by DCs to reduce consumption and search for substitutes of those key imported commodities that they consider in unreliable supply.

³⁶This section only draws a sketch of the preferred regime. Further work in this direction is obviously required to build a consistent and comprehensive commodity regime.

³⁷See J. Pinera (1974).

³⁸It has also been proposed that governments of importing nations should keep larger commodity stocks and perform a buffer function by holding international reserves in commodities instead of having them only in monetary assets.

³⁹The IMF has a compensatory financing scheme available to Fund members which experience export earnings below their trend value. Recently, the EEC countries and 46 African, Caribbean and Pacific (ACP) developing nations signed the Lome Convention, a far-reaching agreement covering many aspects of trade and aid. An earnings stabilization scheme called STABEX was created, according to which ACP exporters of twelve commodities are protected against fluctuations on the proceeds from exports to the EEC on a commodity-by-commodity approach.

⁴⁰This measure would also help to channel in the right direction the desire of some LDCs for more industrialization, that is to sectors with comparative advantage at social prices.

⁴¹Apparently a uranium cartel existed from 1972 to 1975 (during that period uranium prices rose from US\$6 a pound to more than \$40) encompassing the governments of Canada, France, Australia and South Africa, several major uranium-producing companies in those countries,

Gulf of the United States and an English-based mining company, Rio Tinto-Zinc. According to documents of a House Commerce Subcommittee the cartel was highly organized with a paid secretariat in Paris and detailed rules for rigging bids, allocating markets and driving up prices.

⁴²Witness the following description of the industrial structure in aluminum industry: "Six major producers dominate the international aluminum industry. They control 80 percent of western-world primary aluminum capacity, about one-half of world trade in bauxite alumina and aluminum, and a large share of fabrication capacity. The six are all fully integrated from bauxite to metal and are active in mining and processing throughout the world, often through joint ventures with one another and with smaller companies. Substantial potential thus exists for monopoly and monopsony rents from Caribbean mining activities." Gillis and McLure (1975).

⁴³Diaz-Alejandro (1975), p. 226.

⁴⁴See Kravis (1968).

⁴⁵It should be mentioned that the basic source of instability of minerals prices is the business cycle in DCs, its length, depth and, sometimes, synchronization. Perhaps the best service to LDCs by DCs is to find ways -- technical and political as long as it involves government coordination -- to dampen this cycle.

⁴⁶See Bergsten (1973)

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A COMMENT
COMMODITY TRADE FROM A NORTH-SOUTH PERSPECTIVE

Seiji Naya

The paper is a scholarly presentation of various aspects of the market structure that governs commodity trade. The author examines how different market structures meet or do not meet goals of a new International Economic Order, namely efficiency, income redistribution, stabilization and economic security. Adopting "positive" economic analysis, many important issues are evaluated, although the analysis does not give a sense of empirical reality.

He begins by considering the market structure that resembles most closely today's trade, namely the free market. His conclusion is negative on several grounds. First the present free market system is made inefficient and non-competitive because DCs impose tariffs and other important controls. Also mineral trade is largely controlled by a small number of vertically-integrated transnationals.

Second, primary products are subject to wide fluctuations due to demand and supply shifts. Export instability causes a great deal of hardship as it complicates investment, production and consumption processes. Third, today's regime tends to bias the terms of trade against exporters as the oligopolistic and vertically-integrated transnational firms tend to depress the prices received by producer nations. His summary of today's market is that the stabilization objective can be achieved, but to meet other objectives of efficiency and distribution, a change in the bargaining power is needed.

A considerable portion of his paper deals with how price can be raised by cartel or cartel-like arrangements. A wide range of topics is discussed including export taxes, quota, elasticity conditions required to effect price increases, retaliation, bribery by DCs, and adverse impacts on commodity-importing LDCs. The important message one can draw from his analysis is that such price-raising schemes are

not only extremely difficult to implement but also may have adverse effects on some LDCs. Furthermore, as he points out, there is a real threat of all-out economic war due to the likely escalation of the conflict between producing LDCs and consuming DCs.

It is surprising that the author does not even cite any of the historical record of commodity agreements such as the tin agreement. The paper does mention the UNCTAD's Integrated Commodity Programme in connection with the stabilization problems.

He points out that the UNCTAD proposal of buffer stocks does not draw a clear line on whether it is intended to stabilize or change the long-term price trend. He states that if a change in the long-term price trend is intended, chances of successful negotiation are less. He is correct to worry about the vagueness of this distinction. On the other hand, means suggested by the proposal indicate that the objective is to reduce fluctuations rather than change the terms of trade. Buffer stocks, if operated skillfully, can possibly reduce instability. But to maintain the price above the trend it will be necessary to engage in the continuous accumulation of stocks.

Furthermore, LDCs' sales to DCs account for only about 30 percent of the value of world production of items on the UNCTAD list. Hence, there is a possibility that most income transferred by price support would be transferred among DCs.

My understanding of the Programme is that the buffer stock fund would not replace existing commodity agreements. Rather, by providing a ready source of financing for the operations, the fund is designed to encourage the negotiation of commodity agreements for ten to eighteen individual commodities on a product-by-product basis. In his analysis, a number of questions are left untouched. For example, why would there be no merging of all buffer-stock funds into one pool? Also, what is the probable magnitude of the common fund that is likely to meet the objective of stabilization? Although 3 billion dollars is often mentioned, a few references I have seen suggest that the amount is not likely to be sufficient to stabilize prices of even a few commodities, e.g., tin and copper. Also, some empirical studies have not supported the contention that export instability has a retarding influence on investment or on growth. None of these possibilities is mentioned in his presentation.

A COMMENT

COMMODITY TRADE FROM A NORTH-SOUTH PERSPECTIVE

Norman I. Robins

Dr. Pinera begins his paper by saying that international commodities trade can be conducted under various rules of the game and that these regimes can be analyzed along the dimensions of efficiency, income redistribution within and among countries, stability, and economic security. He analyzes the free market, the price raising, the cartel and the commodity agreements regimes. He concludes by suggesting a superior regime comprised of the better elements of the first four regimes and meeting his goals of efficiency, income distribution, stability, and economic security.

My criticisms of the contents of the paper are few; it is an excellent paper. My criticisms are rather of its omissions. These four dimensions, namely efficiency, stability, income redistribution, and economic security constitute only a partial analysis. I would rather see the paper more eclectic, addressing also physical capital formation, human capital formation, and technology transfers.

Pinera points out the existing inefficiencies under the free-market regime. These are caused by barriers to trade and oligopolistic behavior of transnational corporations. Further, in the case of exhaustible resources, oligopolists may exploit the resources too slowly, and a competitive market may exhaust them too quickly.

He also points out the vulnerability of LDCs who depend on one or two commodities for their foreign-exchange earnings and thus their development. As we all know, commodity prices do fluctuate heavily. Multinationals, oligopolistic and vertically integrated, are able to bias terms of trade in favor of the developed countries. Furthermore, today's free market regime is unstable.

Pinera then goes on to analyze price-raising schemes. While a price-raising scheme has an efficiency cost to the world, it can

transfer real resources to the exporting country. At this point, Pinera touches on the notion that if a scheme is instituted, then such a scheme must be workable. He then analyzes efficiency, intra-nation, and inter-nation benefit sharing. His comments on benefit sharing expose its very, very delicate nature. To work, a price-raising scheme as reported by Pinera must have the precision and quality of craftsmanship that simply cannot be produced.

We are then shown the DCs' possible retaliatory strategies against the LDCs when they are formed up as producer cartels. Retaliation may be against the cartel or against a member of the cartel. Here Pinera comments that cohesion is necessary. Thus, he hints at a possibility of a profound weakness. In the long run, the DCs have more flexibility open to them such as substitutes and more sources of production.

Probably the most viable cartelization Pinera discusses occurs when LDC governments ally themselves with multinational corporations. Additionally, although Pinera does not touch on it, this alliance opens up sources of capital to the cartel members. It may be that the alliance militates against technology transfers to cartel members, and it may be that it enhances technology transfers. This question needs further research. Certainly, the technology transfer will exceed the expropriation case.

Pinera distinguishes two types of commodity agreements, those designed to transfer resources and those designed to smooth short-run fluctuations. He recognizes that attaching equity connotations to commodity prices can run from "misleading to inadequate." It amounts to aid, pure and simple. The aid is paid by the consumer in the importing country.

In stabilizing commodity prices Pinera implicitly assumes unstable prices are bad. If instability holds supplies down and supply and demand are both inelastic, instability may be good; the exporter might keep on collecting rents he would otherwise lose with the passage of time.

The author then touches on the various buffer stock, stock funding, and compensatory financing schemes extant.

Pinera then goes on to synthesize his preferred regime from the

desirable components of the others. He assumes that there is universal interest in a moderate international economic order. I think he assumes too much. The developed countries may not at all be interested in order. Instability in commodities may have benefits that accrue to the developed countries: Buying only what one needs and at depressed prices is stabilizing to the profit stream of the purchaser. He further and correctly assumes that a new regime must be built on the basis of some gain to everyone. Last, he assumes, again correctly, that in politicized situations, normally optimal solutions may be neither feasible nor optimal.

The recommended changes are to reduce or eliminate barriers to trade. One can only praise that recommendation. Second, developed countries should redistribute their tariffs as a form of aid. This is a laudable solution to a number of problems and should be pursued vigorously. Third, strengthen futures trading as a buffering device. This is a good idea, but a blueprint is needed. Fourth, institute earnings stabilization. Fifth, eliminate tariff escalation.

In summary, I feel that what is missing from Pinera's paper is an analysis of whether various price-raising schemes can work. Except in very special circumstances, I think they will not. They require too much cooperation from too many competing interests. They are difficult to police, and they bring noncompetitive and inefficient producers into production.

COMMODITY TRADE FROM A NORTH-SOUTH PERSPECTIVE
GENERAL DISCUSSION

Pinera defended his moderate approach on the grounds that reactionary solutions often involve tremendous costs and no progress at all. He disagreed that his "preferred regime" slighted distributive goals. The recommendation for producers associations to bargain for more competitive markets would have positive redistributive effects, since current producer prices are suppressed below competitive levels. The relation of the preferred regime to other goals needed elaboration. He agreed with Robins that it was in practice difficult to distinguish between long- and short-run prices. This was a particular problem for Chile with respect to copper prices.

A participant opened the discussion by reminding that certain givens should be interjected into the discussion. First, the issue of commodity markets has been politicized. Second, one-sided proposals were politically irrelevant, since nations would reach agreement only on a basis of mutual self-interest. Third, technical aspects of commodity markets made achievement of competitive markets, with many small micro units, unrealistic. Producer countries with superior monopolistic positions would more likely be an overwhelming than a balancing force. He went on to suggest that redistributive goals be conceptually distinguished from stabilization goals. The first step is to design a desirable normative scheme. Price stabilization brings world efficiency gains, but does not guarantee income (export-earning) stabilization. So income stabilization schemes should supplement, not replace, price stabilization. Also, since capital markets are not perfectly efficient an investment fund should be established.

Another participant was not sure that it mattered that commodity markets were politicized, since this should not change the economic analyses of the problems. Governments could and would intervene in markets whenever they wished. The task of the economist was to clearly

separate policy goals, and to analyze the impacts of alternative market arrangements with respect to them. Another participant thought that it was important for economists to remind politicians that in the long run free trade was the best policy. Monopolistic prices for commodities will inefficiently divert research and development from beneficial improvements in industrial technology, and towards development of substitutes for high-priced commodities. Still another participant thought the politicization of commodity markets was partly the fault of economists who, ignorant of the structural problems associated with development, made policy recommendations which were irrelevant and out of context.

Robins' argument that price instability may have benefits both for multinational corporations and commodity suppliers provoked much discussion. Price instability lowers long-run supply, which in the face of inelastic demand, increases export earnings. This conclusion is contrary to that of Drysdale's paper which found adverse distributional consequences for developing nations. Participants agreed that there may be offsetting distributional benefits to efficiency losses for some. But distributional consequences were uneven and depended on whether the source of the instability was demand or supply, and whether a country was a net importer or exporter of the commodity. Instability created problems for development planning and trade liberalization policies, and discouraged investment in developing countries. There was an asymmetry in instability impacts between suppliers and purchasers, since multinational corporations have greater opportunities for diversification. One participant concluded that the schemes which transferred risks from suppliers to multinational corporations entailed benefits to the former which outweighed the costs to the latter. Instability also creates problems for developed countries, such as inflation ratchet effects. But this might not be true if there was no underlying inflation, in which case lower commodity prices might very well succeed in lowering the domestic general price level. Price instability generated domestic and international political instability, in particular the possibility of serious confrontation between developed and less developed countries.

A participant thought that the goals of stabilization and distribution were too narrowly expressed. It was mutually desirable to stimulate growth in developing countries, and to insure adequate supplies of commodities to industrial countries. North-South agreements should not be based on resource distribution schemes, but rather on a principle of mutual advantage.

Participants agreed that stabilization and distribution goals should be distinguished. One argued that a buffer stock instrument should be assigned to the stabilization goal, and that lump-sum transfers be devoted to redistribution. Pinera agreed that lump-sum transfers were a first best solution, but questioned their relevance in view of the fact of their present negligible importance.

Pinera's proposal for strengthening organized futures markets was also discussed. While desirable, private long-term buffering was risky, and so futures markets worked on a shorter-term basis in which traders had more confidence in their expectations. Risk aversion by the world community as a whole was less than that for private traders and this should be incorporated into the analysis. Nevertheless, stabilization schemes aimed at reducing risk seemed more realistic than those aimed at shifting it.

A participant remarked that more attention should be paid to stabilizing the demand side of commodity markets, but wondered how confidently business cycles could be dampened. In the case of oil there were linkages between price-raising schemes and demand instability, and thus may or may not be true for other commodities.

JAPAN'S RESOURCE SECURITY AND FOREIGN INVESTMENT IN THE PACIFIC:
A CASE STUDY OF BILATERAL DEVICES BETWEEN ADVANCED COUNTRIES

Kiyoshi Kojima

1. Introduction

The Japanese economy has depended and will continue to depend on the import of huge amounts of resources from abroad. Japan processes these and turns them into manufactured products, earning foreign exchange through the export of part of the resulting output. There remains no other choice for Japan than to expand this processing trade to raise the incomes and welfare of her people. The oil crisis in October 1973, followed by the commodity boom and the American embargo on soybean exports, together with the changes likely in connection with the Law of the Sea, and the strong claims of developing countries for a new international economic order, all mean securing access to resource goods at reasonable prices (or at the same price as other industrialized countries) has become a very serious concern for Japan, creating something of a crisis mentality. A serious concern for resource security is also evident in the U.S.A., Australia and Canada. Although all are resource-rich countries, each has certain specific shortages.

As to the developing countries of the Pacific, some are rich in particular mineral and fuel resources, but most are poor and look to industrialization for economic development following the Japanese model of processing trade. The need for cooperation in the development of potential resources in Pacific developing countries together with the need for assured supply are the primary concerns of nations in the Pacific region. While the five advanced Pacific countries (the United

States, Canada, New Zealand, Australia and Japan) must assume a leading role in solving these problems, an intergovernmental, consultative organization in the area is needed (see Kojima, 1976, and Drysdale). Resource security will be one of the most important concerns for such an organization.

Japan has prompted a method of development for trade under long-term contracts in order to satisfy a rapidly increasing demand for primary products. In Section 2 this is contrasted to the American and European multinational corporations' method of captive development with vertical integration. The merits of the Japanese approach are illustrated in Section 3 by the successful case of the iron ore trade between Japan and Australia. This method brings about dominant buyer-major supplier relations discussed in Section 4. How the five Pacific advanced countries, especially Japan and the U.S.A., have secured ores and ingots from among themselves and the rest of the Pacific region is covered in Section 5 using 1973 as an example. In that year more than 90 percent of the required resources (except oil) were available within the region.

2. Securing Resources

Historically the U.S.A. and major European countries have secured resources through multinational corporations, usually through captive development with vertical integration. That is, a corporation obtains a large area of deposits as a concession and undertakes exploration, development and production through wholly-owned subsidiaries. Not only upstream operations but also such downstream ones such as transportation, processing, distribution and sales throughout the world are integrated. This method has been very efficient and profitable for a number of multinationals; and for many -- oil and copper for example -- oligopolistic domination of worldwide sourcing and worldwide sales has resulted (see Sampson for the oil case).

Japan's case is quite different. Until the 1960s Japan's resource requirements were satisfied through spot purchase on the world market. Quantity was small compared to total world supply. However, by the 60s, rapid heavy and chemical industrialization created a large growth

in demand. Production of steel ingots, for example, increased 3.5 times from 1962 to 1972, with an average annual increment of more than 6 million tons. This made possible almost annual establishment of new integrated mills, instead of patchwork remodelling of old ones, and resulted in dramatic improvement in productivity. In the same period, import demand for iron ore quintupled, with an average annual increment of 7.6 million tons. The quantum steps as new mills came on stream meant a large, lumpy demand not easily filled through spot purchase in the free world market. The story is more or less the same for such important resources as crude-oil, coking coal, bauxite and alumina, copper and so on.

The point is that the Japanese economy was a latecomer in heavy and chemical industrialization and in the mineral resources market, and developed a large demand for natural resources largely controlled by western multinationals.

Fortunately for Japan, at this time huge deposits were being discovered, and the new suppliers were interested in seeing them exploited. There was a willing buyer -- Japan -- and willing sellers, but how to bring them together? The traditional captive development method was out: the suppliers have been resource-nationalistic, and they and Japan generally lacked sufficient capital, technology, and managerial skill (as to the last, see McKern for the Australian case). These the western multinationals have. Japan's primary concern has been simply to assure adequate quantities for downstream operations at reasonable prices without fear of delivery interruptions. Long-term contracts provide this and mitigate the risk to the western firms investing in the actual mining operations, which, to satisfy the host country, have tended to be joint ventures with domestic majority ownership (see Adam for a discussion of worldwide sourcing and Smith on long-term contracts). Japan has promoted development for trade for virtually all raw materials -- minerals, foodstuffs, fish and timber. Development for trade means offshore sourcing through low levels of trade-oriented direct foreign investment. Japan participates to some extent in the development and improvement of productivity of primary products with technological, financial, and sometimes broader economic

assistance in order to import the products to Japan. Financing is limited, taking the form of loans for development with assurance of supply quota or production sharing. Examples are maize in Thailand and oil in Indonesia. Japanese investment in manufacturing in developing countries follows a similar model. (see Kojima 1977, chs. 4 and 5).

Japanese participation in development projects is usually by trading firms. Also, governmental or semigovernmental organizations such as the Japan Export-Import Bank, Overseas Economic Cooperation Fund, and several resource development promotion corporations assist overseas development projects with low-interest loans, technology and information. Japan's development investment in mineral resources increased tremendously in the late 1960s as shown in Table 1.

What kind of role is left for multinationals if the operation of resource production is taken over totally or partially by a resource-owning country? The multinationals' role and their captive development with the vertical integration method have been greatly modified and come closer to the Japanese-type development for trade under the long-term contract method (see Smith and Wells). It is said exploration for resources and establishment of new mines are still difficult for developing countries, but this can be done by use of development contracts, management contracts, or joint ventures. Also marketing, distribution and sales are difficult for the developing country and multinationals still play an important role, but the key element is the long-term contract and Japanese trading firms can do this more efficiently and economically.

3. The Role of Long-term Contracts

Given the large scale, capital-intensive nature of efficient exploitation of mineral deposits, it is preferable to have a guaranteed market for a large proportion of the expected output before production commences. Long-term contract arrangements have substituted for vertical integration as a means of doing this. The extent to which the relationship between Australian mining companies and Japanese metal manufacturers provides a satisfactory substitute for vertical integra-

tion is of fundamental importance for the future development of Australia-Japan trade relations.

In the case of iron ore, the sources, principally Hammersley and Mt. Newman, trade with Japan under long-term contracts concluded with a consortium of Japanese steel mills for which Nippon Steel acts as the negotiating agent.

Contracts have been for given quantities delivered in a specified pattern, generally over 10 to 16 years. While annual base tonnages are specified, buyers usually have a ± 10 percent margin. The intention to exercise this option requires the producer be notified 3 months before commencement of the contract year. Where contracts are on a fixed-quantity basis, variations from specified annual tonnages are made up later, sometimes by extending the original period. Where contracts are on a fixed period basis, exercise of quantity options may reduce or increase the total contract quantity. All contracts have specified a fixed price for a number of years, with provision for negotiating a new fixed price to cover additional years. However, the contracts generally specify the range within which the price can be varied (± 7.5 percent is usual) and often specify that the price remains unchanged if no agreement is reached (Smith, p. 21).

Incidentally, given the importance of Japan as a market for Australian minerals, it is surprising Japanese direct investment in Australian minerals projects is so small. In iron-ore mining only three of seven major projects have involved Japanese participation, and it is limited: Mitsui Bussan and C. Itoh (trading companies) have 10 percent of Mt. Newman; Mitsui, 30 percent of Robe River; and Mitsubishi Shoji and Sumitomo Shoji (trading companies) 50 percent of Savage River. In 1976, Japanese steel mills purchased 6.2 percent of the equity in Hammersley from Kaiser. In Brazil, since 1962 Japanese steel mills have arranged four long-term contracts with Rio Doce Company. In 1970, a contract with Mineracao Brasileiras Reunidas provided 10 percent equity participation. Also in 1970 a joint-venture pelletizing mill with 49 percent equity was established with Rio Doce.

Economies of scale and reduced costs of production are influenced

by several factors. Hitherto, a mine producing 5 million tons a year was considered profitable, but the required output is now 10 to 20 million tons per mine (Hama, p. 86). Rich iron-ore deposits are generally in remote virgin areas, often 400 to 1,000 km inland. This necessitates huge investment in such infrastructure as towns and railways.

Because of the assured and large-scale trade, it is possible to use specialized vessels with resulting economies in transportation costs. Freight costs for iron ore between Australia and Japan using a 160 thousand ton vessel are 19 percent lower than for a 60 thousand ton ship. The distance to Brazil is the longest, and it was thought earlier that its iron ore would never prove to be competitive. But development of triangle transport (oil from the Persian Gulf to Europe, then in ballast to Brazil for iron ore to Japan), lowered freight costs significantly (Hama, pp. 84-86). Highly efficient loading and landing machines, and other improved harbor facilities have helped to decrease handling costs and vessel turnaround time.

Other transaction costs such as the negotiation of contracts, customs clearance, sorting of carriers, settlement of payments, etc., are reduced because they have become standardized transactions, in part because of the involvement of Japanese trading firms.

Almost all the output of an Australian mine is destined for Japanese users who can specify the quality of iron ore and pellets most suitable for them. While an additional advantage for the Japanese steel mills, it involves some disadvantages for the mines, as it makes market diversification more difficult and they consequently bear the entire impact of Japanese demand fluctuations. This has been a source of Australian complaints.

Gains under long-term contracts may be illustrated by an economies of scale model. In Figure 1, Q_{P_w} shows the open market world price (CIF) of iron ore, which Japan and European countries pay in the absence of long-term contracts. A curve CC shows the cost curve over time of an Australian mine developed under long-term contract with Japanese mills. Average production cost is high at the beginning, but decreases rapidly as output increases, then remains at a low constant

level. Transportation and other transaction costs (the vertical distance between CC and TT) are added to production costs (CC) to get total average costs (TT). All cost components experience economies of scale for the reasons mentioned. The kink of the two curves on the same vertical line is just for simplification and is not necessary.

To make the description simple, consider the low constant-cost situation. The maximum price (CIF) a buyer needs to pay without long-term contracts is QP_w (the world market price), whereas the minimum price a seller is able to offer is QT. The difference (TP_w per unit of iron ore) represents gains the buyer and seller can share from development of a new mine.

Historically, in the case of captive mines, almost all such gains have gone to the multinational corporation undertaking the venture, leaving only small concession fees to the host country. How the gains are divided depends on the contract price fixed, and thus on relative bargaining power. Assume a contract price (CIF) is fixed at QP_j . In this case realized gains are TP_j per unit of iron ore for the supplier and P_jP_w for the buyer. The range within which the contract price is determined becomes narrower than TP_w because there are alternative buyers and suppliers.

First, assume the mine annually delivers the quantity OQ at a cost of QC per unit. Remember this is the case when the mine has reduced costs to a minimum, which was made possible only by the guaranteed demand of the contract buyer.

The mine may sell part of its output to others by decreasing deliveries to the contract buyer. In the Japan-Australia case, added profit to the mine from doing this is normally limited since transportation and other transaction costs are greater due to smaller-scale trade and longer distances than for contract trade with Japan. Therefore, the profit for the Australian selling to Japan, TP_j per unit, should be larger than the expected alternative profit from European trade. In other words, the lower limit of the FOB contract price becomes higher than QC by the amount of the alternative profit.

Japan has undertaken a national policy of diversification of supply for important resources to avoid as much as possible the risk of

disturbance inherent in the single-source situation. In the case of iron ore, Japan has developed mines in India, Australia and Brazil under the development for trade under long-term contract method. Since only large-scale developments are economical, Japan's opportunities for diversification have been limited. Japan's demand is so large that all three supply a major portion of their output to Japan. In this way, dominant buyer-major supplier relationships have been established. Japan has a favorable bargaining position as a dominant buyer and has been able to negotiate a CIF price similar, and at the lowest possible level, with each of them. In other words, a competitive supply price from the other contracted sources sets a ceiling contract price in Japan-Australia iron ore trade less than P_w .

There is some evidence, although indirect, concerning gains from trade under the long-term contract model. Figure 2 shows the arrival price of iron ore in Japan from various sources in 1971. Australian ore has the lowest CIF and highest FOB price, indicating both countries share gains from a mutually advantageous trade. Freight on Indian and Chilean ore has yet to be economized significantly (Hama, pp. 87-89).

Figure 3 shows the average price (CIF) of iron-ore arriving in Japan. After a big fluctuation around 1957 due to the Suez Crisis, the price declined steadily from 1961 to 1972, which may be interpreted as a gain to Japanese mills from large-scale development and trade in iron ore under long-term contracts. From 1972 to 1975, the price rose rapidly due to inflation in the producing countries and exchange rate changes. These are sources of difficulty in long-term contractual arrangements. Table 2 shows how favorable the Japanese situation has been compared to others.

4. Dominant Buyer-Major Suppliers Relations

Based on development for trade under long-term contract, Japan has been constructing dominant buyer-major suppliers relations to obtain ores, concentrates and ingots. Japan's situation is seen in Table 3 and for comparison, that of the United States is provided in Table 4. When more than 50 percent of a supplying country's total

exports are to Japan (A = the ratio of exports to Japan), Japan is the dominant buyer and may be able to exercise monopsony bargaining power. When the share of Japan's imports from a given country is greater than 50 percent (B = Japan's dependency on the country), the supplying country is the dominant supplier and can manifest monopoly bargaining power. This rarely occurs since there are at least three different countries supplying most items. When the bargaining power index C (A divided by B) with a country is above one, it means the Japanese bargaining position is stronger in determining and changing long-term contract prices. When the index is less than one, Japan's position is weaker.

The above characteristics are also applicable to the resource security of the United States. What policy implications can be derived from Tables 3 and 4? Close examination is needed for each product and concerning each host country. However, I have summarized in Table 5 the general trend for Japan and the United States.

In the case of Japanese imports of ores (iron, coal, copper, nickel, bauxite, lead, zinc, manganese, chromium and tungsten), the existence of dominant buyer-major suppliers relations is remarkable. That is, in 20 cases out of 32, Japan is the dominant buyer, and there are three of four major suppliers in 8 out of 10 cases. Therefore, in 28 out of 32 cases, Japan's bargaining power is stronger.

Concerning the import of ingots, there are few cases where Japan is a dominant buyer (this is applicable only when she imports ingots of aluminum (alumina mats) from New Zealand, Bahrain and Australia). Therefore, Japan's bargaining position is weak compared with the case of imports of ores. This is because Japanese investment abroad for the development of the refining industry is much less extensive than in the case of ores.

In most cases, the majority of Japanese imports of metal ingots are from American and European multinational corporations which have usually established an oligopolistic market structure. Whether Japan should promote refining abroad through direct investment is an important policy issue. To do this, it would be inevitable for Japanese firms and government to tie up with American and European multinational

enterprises.

For the United States there is not so much difference between the situation for ores and ingots. For both, the United States is generally not a dominant buyer and so her bargaining power is weaker. This is similar to the situation in Japanese import of ingots. However, what differs from the Japanese case is that specific supplying countries often have stronger monopolistic positions, as indicated by higher figures for Index B. Typically the dominant supplier is Canada and the resource in question is obtained from American companies in that country under the captive mines with vertical integration method. The United States also produces many of the resources itself, and the rate of growth of imports of these products is low, so the seemingly weak position is not a major problem.

In addition to advancing Japan's resource security, the long-term contract approach has certain advantages for the stability of world trade in natural resources. If Japan is a dominant buyer in the world market as well as being a dominant buyer from the major suppliers, the long-term contract prices Japan sets and maintains will be prevalent in the world market and will contribute to stabilizing world market prices. When, as is now the case, Japan can secure more than three-quarters of the necessary ores from about three major suppliers, the remaining quarter is purchased on the world free market. This portion can be related to buffer stock operations. When the world market is a buyer's market and the free market price is lower than that of long-term contracts, spot purchases increase, with some portion kept as inventory. Under the reverse conditions, when the market price exceeds that of long-term contracts, spot purchase and inventories are reduced. This can stabilize short-term fluctuations in world free market prices. It can also introduce greater competition into the management of long-term contracts. Japan should carry out this buffer stock operation, for only a dominant buyer is capable of doing it successfully.

While on balance Japan has benefitted from the creation of dominant buyer-major suppliers relations through long-term contracts, there are also limits and difficulties in this system. As mentioned

before, there is a problem as to whether exploration and development of new mines can be stimulated and promoted sufficiently by the Japanese-type arrangement. Japan's enormous demand for resources is surely a great incentive, but alone is not sufficient to ensure development, because capital, technology and active entrepreneurship are also needed. These factors belong to giant European and especially American multinational enterprises, and Japan is obliged to promote new developments in close cooperation with them. Since the sovereignty and nationalism of resource owning countries ought to be respected, the ideal method of resource development is to establish an international joint venture with each party bringing in its own advantageous factor. It should be remembered that the successful development of the Australian iron-ore mines originated from this kind of joint venture.

Though Japan has established favorable dominant buyer-major suppliers relations for the import of the major ores, in case of the import of ingots the relations are much weaker. Processing outside Japan should be promoted in the future, from the point of both desire for development by the resource-owning countries, and conditions on the Japanese side such as the problems of environmental pollution, the exhaustion of domestic ores (copper), the high cost of electricity (aluminum) and so on. Japanese smelting of copper and aluminum abroad has actually started. There is now an important question as to when and to what extent the steel industries should develop production centers abroad (see Kojima 1977, pp. 140-43). Overseas processing may make the Japanese position of dominant buyer of ores weaker. Moreover, it requires much greater capital and higher technology than the development of mines, so Japan will be obliged to get assistance and cooperation from oligopolistic European and American multinational enterprises to a greater degree than in the case of the ores.

For some ores and almost all ingots (and oil), Japan is not a dominant buyer in the world market. In these cases, the proposed stabilization of world market prices through buffer stock operations cannot be effectively implemented by Japan alone. Under such circumstances, closer cooperation with other buyers such as the United States becomes desirable and inevitable.

What kind of primary products are most suitable for the application of development for trade under long-term contract? There are two prerequisites for this method to be applied successfully: Japan's demand must be sufficiently great to justify large-scale development with its substantial economies of scale, and Japan's demand in the world market must be sufficiently dominant that the world market is stabilized by the contract method.

The long-term contract has been perfectly applicable to iron ore and coal. However, where Japan has only a small share of world trade and a weak buyer position (as in ingots and ores such as nickel and zinc from Canada, and bauxite from Australia), the merits of this method cannot be fully realized. Moreover, in the case of oil, Japan is facing a difficulty.

How about foodstuffs, agricultural raw materials, and forestry products? The application of the contract method is rather complex and the advantages seem small. As Japan purchases only a marginal share in world markets, the method's application does not so easily lead to the stabilization of world prices. However, there do exist some products such as timber, maize, beef, and cultured fish where development is advantageous to certain host countries. Economies of scale can be expected when enormous Japanese demand is guaranteed and in these cases development for trade is worth promoting, although long-term contracts fixing both quantity and price should not be made. If a long-term contract is made on quantity, delivery should be at world free market prices. This kind of loose arrangement may also be desirable for some ores and ingots where the position of Japan as a buyer is weak.

One example of the trouble Japan is facing because of a long-term contract is sugar between Japan and Australia. In total world trade in sugar, Japan's imports were about 13 percent in 1973, and the export share of Australia was 11 percent. Japan takes 29 percent of Australia's sugar exports and Japan's imports from Australia are 26 percent of total imports, so bargaining power is almost equal. In this kind of bilateral trade, which is rather marginal in the world market, if the price as well as the quantity are fixed for a long term, it can cause difficulties for both parties. As neither country has the power to

influence the world market price, complaint occurs on the buyer's side if the contracted price greatly exceeds the free market price as at present, while complaint on the supplier's side arises if conditions become the opposite. Therefore, the contract should have been limited just to the quantity. A quantity assurance alone will stimulate new production, rationalization and economies of scale in the Australian sugar industry.

Needless to say, whether or not the development for trade under long-term contract is applicable must be examined in detail on a case-by-case basis. Since the development for trade under long-term contract involves bilateral arrangements between private enterprises, it is also necessary to relate it to such multilateral arrangements as international commodity agreements, the Integrated Commodity Scheme (Colea Plan) of UNCTAD, resource producers' cartels such as OPEC, CIPEC, etc., resource consumers' association such as the International Energy Agency, and to the Council for International Economic Cooperation. To survey them here is too cumbersome, and I will make just two observations. First, I believe it is necessary to stabilize short-term cyclical price fluctuations of primary commodities, and I do not think buffer-stock operations with the limited aim of price stabilization necessitate large-scale costs. Such buffer-stock operations must be differentiated from those for emergency or other strategic situations. Second, what is lacking in all these multilateral arrangements are positive measures to develop new sources of natural resources which are expected to be in short supply. For this purpose the development for trade under long-term contract is more useful and preferable to the captive mine with vertical integration method of oligopolistic multinationals.

5. Resource Security in the Pacific Area

Let us examine next how it is possible for the five Pacific advanced countries, the United States, Japan, Canada, Australia and New Zealand, to secure resources. I have worked out the 1973 matrices of trade for each of the major metal products imported by the five

(Table 6). Canada and Australia are big suppliers of resources. For them and New Zealand, all with quite small imports, resource security is not an important problem. Therefore special attention is given to Japan and the United States. There are many items Japan imports relatively more than the United States. This is particularly true of four ores: iron, coal, copper and nickel. Only in the case of bauxite are American imports absolutely large than Japan's.

Except for nickel, U.S. ingot imports are generally much larger than Japan's, although there is not so much difference in copper, aluminum and tin ingots. Most ingots imported into the United States have been processed by American firms, while there is very little offshore Japanese production. Japan imports more crude oil than the United States, but both import an enormous amount.

The implications are that for ores, although Japan can be a dominant buyer alone (except in the case of bauxite), Japan's position is strengthened if the United States cooperates, and for ingots, especially from owned smelters, and crude oil, Japan is cooperation with the United States can achieve the position of dominant buyer.

Looking further at ores, Japan can satisfy 52 percent of its demand for iron, 91 percent for coal, 47 percent for copper, and 62 percent for bauxite from other Pacific advanced countries. From the region as a whole, both Japan and the United States can obtain more than 90 percent of their needs. That Japan is able to secure something over half the needed ores from the other four advanced Pacific countries is important, for as these countries are not likely to join resource cartels, Japan can hopefully be guaranteed at least some resources by keeping cordial relations with them. Moreover, if solidarity and cooperation is strengthened in the region, Japan and the United States will be able to secure almost all of their ore needs. This is one of the reasons why establishment of an organization such as the Organization for Pacific Trade, Aid and Development (OPTAD), is long-awaited.

As for ingots, the amount Japan is supplied by the other four Pacific advanced countries is much smaller than in the case of the ores. The highest ratio is aluminum and it is only 49 percent. If

extended to the Pacific area as a whole, tin reaches 98 percent but other ingots remain at low levels. There are many reasons why Japan has had to look outside the region for ingots. American and European oligopolistic firms dominate the area -- the United States secures 72 percent of its nickel and more than 80 percent of other ingots from the Pacific region. New supply sources have been in other areas. However, Japan can probably secure more ingots from the Pacific area if closer cooperation with American multinational corporations is pursued. Such cooperation should be realized as soon as possible.

In the case of crude oil, mentioned as a reference, the supply ratio from the area is low for both Japan and the United States, i.e., 18 percent for Japan and 57 percent for the United States. Both depend overwhelmingly on the Arabs. Crude oil is different from other natural resources in that it will be exhausted within the foreseeable future, which explains OPEC's present success. It is also exceptional since it is the only resource difficult to secure in the Pacific area for Japan, the United States, Australia and New Zealand -- perhaps only Canada is self-sufficient in this area. The problem of petroleum should be examined more broadly. Japan and the United States need to cooperate in approaches to the Arabs (especially to Saudi Arabia) and to foster new development in the Mid-East through the Japanese-type development for trade under long-term contract system. Both Japan and the United States are still in a weak bargaining position vis-a-vis Saudi Arabia (see Tables 3 and 4). Japan and the United States should also participate actively in developing oil fields in the U.S.S.R., China and other Asian and Latin American countries through international joint ventures.

While petroleum will be exhausted in the near future, we do not need to be concerned with the exhaustion of other mineral resources. Japanese resource policy has the following four objectives: diversify supply sources to reduce risks, undertake direct investment in processing abroad, build buffer stocks, and transform and upgrade the Japanese industrial structure to economize use of energy and other natural resources. Among these, the fourth seems somewhat questionable. For environmental reasons, to achieve higher value added in

manufacturing, and to decrease import dependence, economization of energy and natural resources can be dealt with on the same footing. But while it is obvious we should economize the use of oil, this does not lead to the conclusion we should reduce consumption of mineral resource which are still quite abundant. Rather, there are many nations wishing to develop new mines to earn foreign exchange for economic development. The large Japanese market is an important outlet for them.

6. Conclusion

This paper shows why the Japanese-type method of development for trade under long-term contract should be highly valued and used as the most important policy for Japanese resource security. The method has been considered a weak policy which Japan was obliged to adopt because of lack of capital and being a latecomer as a buyer and developer of resources. On the contrary, it is a unique policy for resource security that can be promoted in the new world political environment. Similar conclusions have been reached by Ozawa.

However, in order to insure the resource security of Japan and the Pacific area by the long-term contract method, Japan should respect the leadership of the resource holding countries and, at the same time, recognize that international joint ventures with western multinationals is the ideal form. Here, cooperation among the three parties -- Japan, multinational, and host country -- is indispensable. A cooperative relationship such as this ought to be established.

JAPAN'S RESOURCE SECURITY AND FOREIGN INVESTMENT IN THE PACIFIC;
A CASE STUDY OF BILATERAL DEVICES BETWEEN ADVANCED COUNTRIES
A COMMENT

Michael Keran

I would like to start my discussion by letting you know the direction I come from in making my remarks. All I know about raw material trade issues I have learned at this conference. Thus, I am a new boy on this particular street. My approach will be general rather than specific.

We have come to expect from Professor Kojima's fertile mind the kind of paper he has given us today. It is in the mainstream of positive economics. He observes a phenomena in the marketplace, in this case the existence of long-term raw material contracts; he applies considerable imagination and insight to providing an explanation for the phenomena; then he describes public policy implications. His interesting blend of theory and institutional detail provides a fresh new view of the process and its implications for the future. As usual in such an individual effort, the analysis is both thought-provoking and provocative.

The core of the paper contrasts the long-term contract approach of Japan versus the multinational corporation approach of the United States in "providing secure sources of raw materials." Professor Kojima concludes that because of the rise of what he calls "resource nationalism" the Japanese model of long-run contracts is becoming increasingly superior to the U.S. model and will become the dominant model for future acquisitions of raw materials.

I have two general comments to make on the paper which are more in the form of elaboration and possible extension rather than criticism.

- (1) The economic role of long-term contracts;
- (2) Some questions regarding the nature of the difference between the long-term contract and the multinational corporate models for delivering raw materials.

Why Long-Term Contracts?

With regard to the first issue, we might be asked why Japan would choose to buy its raw material needs via long-term contracts rather than via the spot market at world prices. Economic theory tells us that the spot market price for commodities incorporates information not only on current costs and demand but also on future costs and demands implicit in the currently available information. If one is risk-adverse and wishes to have assured prices and quantities in the future, there are well-established "futures markets" in most commodities. Thus a combination of spot and futures markets would seem to provide all of the protection a buyer or a seller could expect in this uncertain world.

The problem is that futures markets extend only for one or two years. This suggests that futures contracts for delivery beyond that period are so expensive that most market participants are not prepared to pay the price. Beyond a year or so the worldwide potential for political and economic uncertainty apparently rises substantially and thus raises hedging costs to a prohibitive level.

The role of long-term contracts can be seen, in effect, as the extension of futures markets beyond the one- to two-year time horizon. Why is it profitable for a buyer and seller to engage in a bilateral ten-year contract when it is prohibitive for them to do so through an organized futures market for ten years? The answer, I suspect, is that the cost of acquiring bilateral information is lower than for acquiring multilateral information. Long-term contracts are negotiated between countries with a relatively high degree of political and economic stability, such as Japan and Australia, where the perceived uncertainties are much less than in a multilateral world setting.

What explains the timing of long-term contracts which Kojima dates from the early to mid-1960's? As the Japanese economy grew its

demands became a progressively larger percent of the world demand for certain raw materials. Thus, Japan gradually moved from being a price taker to a price maker, not as a monopolist but as a monopsonist. In this context, individual Japanese corporate purchasers may continue to be price takers. However, each firm increased its demand for raw materials at the same time as all other Japanese firms, because each was subject to the same business cycle demand for its final output. As a result, individual firms would observe that when their demand went up the world price of the product would tend to increase, and when their demand fell the world price of the product fell. On balance, this would lead to higher average prices for purchases of raw materials. Bilateral long-term contracts, by smoothing out these cyclical fluctuations, provide a method of reducing the average cost of raw materials to Japanese firms.

The problem with long-term contracts in general is that, while fixing the price and quantity at the beginning of the contract period reduces uncertainty by providing known prices and quantities, it can also lead to windfall gains and losses. If the spot world price should rise, the host supplier country will have suffered a windfall loss, and if the world price should fall, the Japanese consumer of the raw material will have suffered the loss. Thus, long-term contracts with fixed price and quantity conditions require a high degree of confidence about the low variance of world prices as well as a low variance in the world business cycle.

The experience of the 1970's has been, of course, just the opposite. World prices for raw materials have been sharply higher in level and variance and the world business cycle has been much more volatile than in the past. As a result, host countries have demanded renegotiation of contract prices upward, and Japan has demanded renegotiation of contract quantities downward. Parallel with this there is a strong move toward reducing the length of long-term contracts. This, of course, collapses the long-term contract into an instrument which is indistinguishable from a standard contract in the futures market.

Two general observations regarding the long-term contracts emerge.

- (1) The greater the degree of uncertainty about the future, the shorter will be the average length of long-term contracts;
- (2) Institutional arrangements to anticipate increased uncertainty about the future must be symmetrical between the interest of the buyer and seller. For example, Ben Smith in his paper suggests a method of dealing with price uncertainty by indexing bilateral long-term contracts for the relative inflation rate and exchange rate changes in the two countries. In retrospect, if Australia had in fact had such a clause in its long-term contracts five or ten years ago, it would have been substantially better off today, at least in the sense of not using the "begging bowl" approach to renegotiation of its long-term contract. However, Japan would have been worse off. To provide a symmetrical protection for both parties a method would have to be found to deal with both price and quantity uncertainty. In the Japanese case, their derived demand for raw materials could be linked with the demand for their output. This could be done relatively easily, I suspect, by having contracts with constant shares rather than in absolute values.

These institutional devices are designed to maintain constant relative prices and quantities over the contract life in the face of increased variance in underlying economic conditions. They are designed to prevent changes in relative prices or quantities demanded which would distribute windfall gains or losses in a way which was not related to economic efficiency. For example, if the spot price of the commodity under contract should rise because of an increase in world inflation, the relative price in the long-term contract would, in fact, fall, leading to an excess demand for the product and perhaps the necessity of inefficient non-price rationing devices.

Distinction Between the Japanese and U.S. Models

My second comment is related to the distinction being made between the Japanese long-term contract model and the U.S. multinational corporate model. Kojima sees the Japanese model as the wave of the

future in the new era of rising resource nationalism which will tend to preclude the further advancement of the multinational corporation.

The author may be right in this forecast, but I would like to suggest an alternative interpretation of the evidence he presents. First, in regard to the reasons the Japanese chose the long-term contract route and, second, with regard to the differences between the two models.

Kojima argues that because Japan was a latecomer to the raw materials Big League, it was forced to go the long-term contract route because U.S. multinational corporations had such a head start on them. An alternative explanation is that Japanese exchange controls, specifically restrictions on capital exports in the 1960's, acted as a major constraint on direct investment abroad. Related to this explanation, there was undoubtedly in some potential host countries a continued resentment toward Japan from World War II, which would have made them resist Japanese direct investment. Thus, I would argue that these institutional factors and not primarily economic factors explain why Japan did not go the route of the multinational corporation.

If the Japanese had been free to choose that route, would they, in fact, have taken it? That type of "what if" speculation is not fruitful. However, it would be useful to consider what are the bare-bone distinctions between the two approaches to acquiring raw materials.

Consider first the multinational corporation approach. Their incentive toward vertical integration is related to improving the internal rate of return of the corporation. In the case of raw material deposits, an important element would be internalizing the rental value of high-grade deposits. In the 1950's and 1960's when the prices of raw materials were relatively low and the commercial risks of exploitation were relatively high, the opportunities for profitable exploitation were not considered great and many host countries needed to provide incentives to encourage multinational corporations to come in. A good example are the subsidies and tax forgiveness which Australia provided.

In the current situation when the relative price of raw materials

is high and, with improved information and marketing skills, commercial risks are relatively low, multinational corporations could anticipate high rates of return from natural resource investment. In this context, the negotiating position of host countries is strong, and subsidies are turned into taxes and increased royalties, thereby allowing the host country to share in the higher returns.

Now consider the case of the long-term contract. When world prices were relatively low in the 1950's and 1960's, the contract price and quantity arrangements would tend to favor the buying country, in this case Japan. Conversely, in the current situation where world prices of raw materials are relatively high, the contract arrangement would tend to favor the host country.

The point to be made is when both parties have the same perceptions about the future, the long-term contract and multinational corporation approaches will lead to rates of return for both parties which would be approximately the same. In this context they represent different institutional arrangements to accomplish the same economic goal and division of the gains from trade.

The difficulty arises when the long-term or the multinational corporate agreement is made in one environment, say relatively low world prices, and that environment changes to one of relatively high world prices. That is the circumstance we have faced over the last four years. In this context, the rise of resource nationalism is primarily the reflection of the recent higher relative price of raw materials.

I would argue that the question of which model is superior relates to which one is more adaptable to the resolution of conflict. In the case of the multinational corporation, the act of abrogating their arrangement through nationalization, expropriation and other legal devices is treated far more seriously in the international community than renegotiating of a long-term contract. However, it should be recognized that the present value loss could be the same in each case. The loss to the multinational corporation of nationalization is obvious; however, the holder of a long-term contract who is forced to raise the contract price 20 percent from that originally agreed upon has also suffered a real present value loss.

On balance, therefore, it probably is true that the costs of changing long-term contracts are lower than the cost of changing the property rights of the multinational corporation

This conclusion is close to that of Professor Kojima but for different reasons. The validity of this conclusion should be tested by a much deeper political and economic analysis than is possible here to determine which institutional framework is the most favorable to the resolution of conflicts.

JAPAN'S RESOURCE SECURITY AND FOREIGN INVESTMENT IN THE PACIFIC:
 A CASE STUDY OF BILATERAL DEVICES BETWEEN ADVANCED COUNTRIES
 A COMMENT

Kuo-shu Liang

Professor Kojima's paper contrasts the Japanese-type "development import cum long-term contract" method to the American and European multinational corporation's "captive development cum vertical integration method." It is stressed that the Japanese method, as evidenced by Japanese participation in Australian iron-ore mining, provides assurances for lumpy market conditions and encourages large-scale development of mineral resources which results in significant economies of scale as well as reduction in transportation costs. The method also meets and satisfies the resource nationalism of the host producing country, because Japanese interests do not lie in profits from upstream but in securing resource needs at reasonable prices. Professor Kojima further points out that the multinationals' role and their "captive development cum vertical integration" method are greatly modified as host countries assume more control and right to make basic policy decisions. Their rule has actually become closer to the Japanese type.

I am very happy to have this opportunity to comment on Professor Kojima's excellent paper which sheds light on major questions involved in Japan's resource security and foreign investment in the Pacific. My brief comments raise a few questions for further discussion.

(1) The establishment of dominant buyer-major suppliers relationship under the Japanese-type "development import cum long-term contract" method will make the price theoretically indeterminate within

the "bargaining range." Japan's bargaining position, resource security, and economic efficiency appear to be Professor Kojima's major concerns. However, Japan should go beyond conventional yardsticks in making investment decisions. A further study may be required on the strategy of mineral-sector development in the host country so as to maximize its contributions to national well-being on a broad scale, for example, by encouraging conservation, training of nationals, and reinvestment of profits in productive activities.

(2) Professor Kojima suggests that the Japanese-type "development import cum long-term contract" system coupled with buffer stock operation will contribute to stabilizing world market prices. Japan, as a dominant buyer, should carry out buffer stock operations with concern, responsibility, and liability. However, I do have some reservation on the proposed responsible buffer-stock operation as was evidenced by the overacting and destabilizing behavior of the Japanese trading companies in 1973 and 1974.

(3) It is said that:¹

Japan's vast and expanding need for raw materials and her policy of diversifying the sources of supply induced her not to overlook small projects and benefitted many small countries in Africa. The pressure of Japanese competition jolted the generally conservative European investors into action and shortened project appraisal and investment decision time in some cases. The relative security of markets provided through long-term contracts was instrumental in attracting co-investors.

However, Professor Kojima stresses that the Japanese-type "development import cum long-term contract," though it is favorable to Japan, should have its own limits, and cooperation with other big consumers of resources and the American multinational corporations is inevitable. It may be very effective to make a joint effort for resource discovery and exploitation with capital, technology, entrepreneurship and management skills, and markets being jointly provided, but this type of cooperation may have to be carefully carried on without inducing the sentiment of neocolonial exploitations. In addition to the challenge facing these firms in the short run to smooth dangerous cyclical movements, they have to ensure a much-needed expanded flow of investment in the long run. The problem of investment has to be investigated

further from the points of view of the size of investment, fluctuation, and distribution of the gain.

(4) Professor Kojima's paper limits the analysis to nonfuel minerals and only briefly refers to the major objectives of Japanese resource policy. It will be very informative if the strategies to be adopted by the Japanese government to attain some of these objectives are described in some detail.

FOOTNOTES

¹R. Rosson and B. Varon, The Mining Industry and Developing Countries. (New York: Oxford University Press, 1977), p. 94.

JAPAN'S RESOURCE SECURITY AND FOREIGN INVESTMENT IN THE PACIFIC:
A CASE STUDY OF BILATERAL DEVICES BETWEEN ADVANCED COUNTRIES

GENERAL DISCUSSION

Does Japan Inc. exist as a minerals buyer -- or are negotiations on contracts among companies? It is important to remember that, with few exceptions, minerals are being handled by private firms rather than countries. Thus one cannot speak of true diversity of sources merely because a mineral is obtained from three countries if the same supplying company is involved.

Long-term contracts have been better for Japan than direct investment would have been, and this result needs to be tied to the Hymer/Kindleberger theory of direct investment. (See, Peter Drysdale, ed. Direct Foreign Investment in Asia and the Pacific. Proceedings of the Third Conference on Pacific Trade and Development (Canberra: Australian National University Press, 1972))

Despite this success, and the probable accompanying cost savings, the Japanese government apparently is now subsidizing direct investment in minerals, probably for strategic reasons. The bureaucracy has thus missed the point that direct investments are not particularly secure, and that contracts involve much less political trouble. (It was also suggested the investment was to reduce foreign exchange reserves and thus delay yen revaluation.)

In general, long-term contracts probably are more advantageous to buyers than sellers. In the Canadian case, there is a need for market access for output-induced acceptance, with the result that specific projects are overly dependent on specific markets. This view was challenged by two other participants. In the Canadian case, specifically, the projects were marginal in the first place and thus are poor examples.

As to how bargaining should be characterized, in the long-term both sides can turn to third parties. What is important is what will

be lost by failure to reach agreement, and how the loss can be stood. Japanese do tend to act as consortia when buying, and sellers typically do not. Before the agreement, the buyer is generally in a stronger position, but once the developer has made an investment, it can in effect be held hostage by the host.

Smaller countries such as Korea are worried Japan might monopolize long-term contracts and discriminate against them. A most-favored term clause, or at least limits on deviation, might be used to alleviate this. Korea and others have benefitted from the excess output of projects developed to fill Japanese contracts.

Business cycles make long-term contracts risky. However, it was noted the parties probably expected renegotiation of "fixed prices" would be mutually acceptable over the life of the contract. As observed several times in other discussion, contracts are a commitment to cooperate and protect each other from real threats, with some expectation of renegotiation if conditions should change markedly.

Stabilization was felt by some to be hurt by contracts, and by others to be promoted. Quantities committed under contracts are not available on the open market, and this will affect the price of what does trade openly. However, only a small share of total mineral trade is done in the spot market, and the thinning effect of contracts is no more distorting than direct investment for captive sources. It was also noted that future markets involve speculators with no stocks of minerals and no desire to hold any, so there are real risks in dealing in futures as a source or outlet for supplies.

A possible disadvantage of contract commitments is the fixing of production patterns in the producing country, making structural changes harder. However, this is not unique to long-term contracts.

The existence of buffer stocks does not mean they will be used in a stabilizing way, and it was asked if examples can be cited. Producers may be reluctant to deal with monopsonistic buffers, especially where they are already dependent on only a few buyers.

The mechanisms financing new projects have increased the number of suppliers, and this has led to price depression and destabilization.

In his reply to comments, Mr. Kojima pointed out some contracts

fix both price and quantity, while others fix only the quantity.

The rationale for long-term contracts relates to the long lead time in resource projects -- and this pertains to agriculture as well. The guarantee of a market for output makes planning of projects at an optimal scale easier, and the resulting scale economics can be shared. Mr. Kojima suggested prices need to be fairly firmly fixed during at least part of the initial period to recover development costs.

Finally, it was mentioned that long-term contracts can also avoid such problems as transfer-pricing tax evasion.

THE WIDER CONTEXT OF BILATERAL RESOURCE
EXPLOITATION ARRANGEMENTS BETWEEN THE LDCs AND THE DCs

Miguel S. Wionczek

1. Introduction

I submit that the future shape of bilateral arrangements covering exploration, exploitation and international trade in mineral resources, between the resource-rich LDCs and the major resource-consuming DCs,¹ can be perceived with certain clarity only if and when answers are provided to some questions of deep concern to many people in the developed countries. These key questions are:

- a) Does the world at large face a period of growing mineral resource scarcity?
- b) In what sense does the problem of DC access to LDC mineral resources arise?
- c) Are the LDC demands regarding the future use of their mineral resources conflicting with the general objective of world economic expansion; in other words, what is the "new international economic order" with respect to non-renewable resources?
- d) What is the actual state of the contractual relations between the LDC resource-holders and the DC resource-users and are the present tensions between the two parties a temporary or a permanent feature of international economic relations?

The evidence presented in this paper suggests the following answers to these four questions:

- a) There is no growing global mineral resources scarcity.
- b) The problem of access to the LDC mineral resources can be meaningfully discussed today only in terms of changing

conditions of access and not of free unconditional access.

- c) The future external use of the LDC mineral resources as postulated by LDCs is not in conflict with the needs of an expanding international economy; moreover, the proposals in that respect incorporated into the agenda of the "new international economic order" are hardly revolutionary.
- d) The contractual relations between most LDC resource-holders and DC resource-users as actually practiced have undergone very substantial changes over the past twenty years; these changes started long before the concept of the "new international economic order" was coined by the LDCs in 1974.

Consequently, along with the changing patterns of international political and economic relations between the LDCs and the DCs, the future bilateral resource arrangements will be the result of the continuous process of mutual adjustments interwoven with momentary conflicts of interest. These conflicts will not degenerate however, into a "resources war" unless, of course, political and economic relations between these two sectors of the world economy degenerate into a series of bitter confrontations.

2. Mineral Scarcity

In spite of the fact that both the planet and its resources are finite and exhaustible it is impossible to marshal any serious evidence in support of a position that the world at large faces a period of growing mineral resources scarcity. Not only were the alarmist theses of the briefly famous Limits to Growth satisfactorily disposed of by the subsequent wave of political, economic and technological criticisms, but they have been also contradicted by the findings of two recent inquiries into the longer-term prospects for the world economy undertaken by two Nobel Prize laureates, Jan Tinbergen

and Wassily Leontieff.²

According to the Tinbergen study, while the fear of exhaustion of natural resources, together with the measures taken by the OPEC countries, has started international discussions on natural resources in general and on non-renewable resources in particular, an overall shortage of minerals in the near future does not appear a real danger. The quantity of metals, minerals and other useful elements contained in the first 1,000 meters of the earth's crust and in the seas represents, with the exception of oil, several million, or even several hundred million, times the world's present annual consumption.³

In the opinion of the Leontieff study, the availability of mineral resources -- even under relatively conservative estimates of resources endowments and the uncertainties associated with long-run supply-demand balance -- should not create physical obstacles to the sustained growth of the world economy at least for the next 25 years. Neither are obstacles of a technological nature to be expected. On the other hand, the Leontieff group believes that far-reaching internal social, political and institutional changes in the LDCs and significant adjustments in the world economic order would be of considerable help in assuring the world economy a rate of growth comparable to that of the first post-World War II quarter of a century.⁴

In the absence of more competent experts on the world economy than Tinbergen and Leontieff, the first of the questions may be considered as answered negatively.⁵ Thus the world does not appear to be facing a period of growing mineral resource scarcity.

It is sometimes argued that while in an absolute, physical sense worldwide resource depletion is not forthcoming and hence may seem reassuring for the medium-term growth of the world economy, it ignores the cost dimension that has important implications for both the combination of factors used in the production of intermediate and final goods and the total cost of producing these goods. Furthermore, it is argued that at least some literature dealing with mineral resources problems suggests that in recent years resource costs increased in real terms because the cost reducing effects of technological change in

mining were unable to offset both rising scarcity rents and the increased costs of exploiting more inaccessible and poorer quality ore bodies. In fact, however, the evidence in respect to rising cost trends not only is still very sketchy but also it is based upon the unproven assumption that most -- if not all -- easily accessible and high-quality mineral resources have already been located, have entered into production stream, and are approaching depletion. Recent discoveries of extremely rich deposits of sulphur and copper in Central Europe, natural gas in France, iron ore in Australia and oil in Mexico (parts of the planet presumably well-surveyed geologically) strongly suggest that the world economy is still very far from the stage in which only inaccessible or poorer quality mineral resources are left for exploitation at increasing costs. On the other hand, in the cases when this might occur technological innovation would accelerate, resulting in the substitution of "cheaper" resources for those showing constantly increasing costs. Such phenomenon has been occurring even in the "very special" case of petroleum.

3. DC Access to LDC Minerals

Does the lack of DC access to mineral resources represent a major obstacle to the growth of industrial economies? It seems that the deep concern with this issue may be due to some ignorance of the dynamics of resource availability and of the imperative needs for growth in the LDCs. Moreover, some do not realize that political realities have changed from the first half of the present century when the DC resource-consumers used to enjoy the "divine right" of free unconditional access to the LDC resources under traditional concessions.

The lack of clear definition with respect to what the right of access should and should not mean may underlie the wider confusion arising from the popular concept of resource scarcity that erroneously equates resources with reserves. Contrary to the popular impression, in part created by the term "nonrenewable resources," mineral resources are not fixed quantities but change over time. Reserves

refer to the subset of total resources which are identified (proven, probable or possible), and recoverable in a given period in the context of existing economic and technological conditions. Consequently, the magnitude of recoverable reserves is constantly changing. Reserves are reduced by downward price changes, increases in costs, expanded availability of substitute materials and by public restrictive regulation. They are at the same time constantly enlarged by new discoveries and by new political, economic and technological developments that make it possible to produce from deposits that could not be exploited before.

The meaningful appraisal of the access to mineral resources at the global or national level is made particularly difficult by information limitations. The only source of detailed data about mineral resources stock (i.e., reserves recoverable at a given point of time) is the resources industry, which has an incentive to propagate the image of resource scarcity and to magnify barriers to the entry into resource exploitation. The exclusive holding of such information is a prerequisite for successful participation in the oligopolistic game of exporting and internationally trading mineral resources.⁶

Except for a portion of the ocean floor, and this is true only temporarily judging by the slow but steady progress of the U.N. Conference on the Law of the Sea,⁷ there is not a "no man's land" left on the planet. The issue of free access to the world's non-renewable resources stopped being relevant with the end of the political decolonization phase that closed in 1975 with the disappearance of the Portuguese colonial empire in Africa. Discussion of the conditions of access must take into consideration both global resources availability and the changing modes of resource exploitation in the LDCs.

Among the factors that have a direct bearing upon the security of supply for resource-deficient DCs and the barriers to entry into resource-rich LDCs, of particular relevance are (1) the expansion of geographic limits to recoverable resources, (2) the emergence and proliferation of independent enterprises ready to provide services to

the LDCs, (3) the growing LDC resource policy sophistication, and (4) the increased domestic resource use by the LDCs themselves.

Despite rapid post-war rates of industrial growth, resource availability has more than kept pace with the increase in global consumption. Both political changes (decolonization) and the technological revolution in exploration techniques are responsible for increased resource availability. This expansion has occurred practically everywhere. In Africa the myth of the resources concentration in temperate parts of that continent (Eastern and Southern Africa) was destroyed by the important discoveries in tropical West and Central Africa and in the desertic sub-Sahara region. In Asia the enormous mineral wealth of Soviet Siberia and China, practically unknown only 20 years ago, was confirmed. Similar occurrences were registered in the polar and subpolar parts of the Northern Hemisphere (Canada and Alaska). Other instances of changes in resources availability occurred in South America, Southeast Asia and even in Europe (Poland, both Germanies and France, among others), a continent supposedly more than fully explored over the past several hundred years.

Many new exploratory techniques which originated directly or indirectly from the space program became common knowledge, as they were developed not by private industries but by the governments of major powers. In the case of some particularly sophisticated and costly exploration methods, a proliferation of technical supply sources followed. Practically anyone in charge of resources management policy, not only in the DCs but in semi-developed resource-rich nations, is cognizant by now of this important development. The rapidly expanding availability of exploration technologies has been just as responsible as any nationalistic pressures for the decline of the traditional package of exploration cum exploitation cum export trade of unprocessed resources, that characterized the private mineral resources industry until the 1950s.

Then came a fairly recent extension to the LDCs of the concept of mineral resources development. Only a few officials responsible for mineral development in the LDCs are still unaware of the important role these resources can play in the national economy. The potential

contribution to be made by mineral development in providing employment, in contributing revenues through royalties and taxes, and in providing foreign exchange through mineral resources export is generally better understood in LDCs than it may be thought. Nor does it escape the LDCs' attention that the infrastructural aspects of mineral exploitation have an important bearing upon the general economic and social modernization process. The associated development of communications, townships, public utilities, medical and educational services follows on the footsteps of major discoveries and of the development of important non-renewable resource deposits in relatively virgin and underdeveloped areas.

The "discovery" of the resource management concept led the LDCs one step further. As even the poorest LDCs want to break from the patterns of agricultural underdevelopment and to diversify their economies, they started appreciating that mineral resources development can hardly be left to accidental foreign initiatives. Many of them realize that the domestic capacity to manage resources is necessary not only for the purpose of striking more advantageous deals with foreign private interests, but also to make mining a major sector of the economy. To help develop a domestic resource policy capacity, the LDCs have a number of relatively new alternative sources of information, knowledge and assistance: (1) DC independent consulting firms, (2) survey missions from the socialist bloc and (3) technical assistance programs of the U.N. agencies.⁸ In addition, missions from international financial organizations for development of improved tax systems, and advisers from the former metropolis (keen upon diminishing the ex-colonies' dependence upon bilateral financial aid) were of important indirect assistance. In this way, the external non-private participation in the early operational stages in LDC mineral development (basic mapping, exploration for and evaluation of potential resources) and also in the establishment of an institutional framework for development of the mining sector (geological and mining bureaus, state mining corporations, training of professionals, etc.) became the increasingly important external input into the formation of

mineral resources development policy in LDCs. This factor hardly receives any attention among those in the DC's who are preoccupied with the theory that barriers to "free access" to LDC mineral resources arise from simple "irrational" nationalism.

The next factor to be considered is the growing operational management capacity developed locally in the LDCs through the long presence of foreign private mining enterprise. That capacity has been generated by : (1) the supervisory activities of local authorities over foreign mining; (2) the LDC restrictive policies on skilled labor importation; and (3) the large and increasing gap between the cost of expatriate and local personnel. Consequently, with the possible exception of such places as Zaire or perhaps Papua New Guinea, local participation in operational and, to a growing extent, administrative and financial management of mining operations have increased dramatically within the past two decades. One example may suffice here. At the time of the Mexican oil nationalization in 1938 the number of local engineers employed by foreign companies hardly exceeded twenty and even the majority of foremen were foreign. When, in 1976, Venezuela bought out foreign oil companies no more than 50 top executives were foreigners in the third largest LDC oil set-up in the world. The presence of the local resources management capacity at the enterprise level, and the well-founded belief of most LDCs that new mining development projects of such capacity can be established in the medium term, play a major role in shaping the new relations between the LDC resource-holders and the DC resource-users.

Finally, it must be kept in mind that some of the resource-richest LDCs such as Brazil, Mexico, Indonesia and Malaysia have advanced considerably on the road to industrialization. Thus their attitudes towards resource exports is becoming conditioned by longer-term industrialization objectives that include manufacturing of industrial goods for export.⁹

International mining enterprises have responded to these new factors in the world resource scene by making a conscious effort to loosen their ties with some more advanced LDCs in favor of more remote

but less politically sophisticated LDC's. The future history of the post-war mining in the colonial or the post-colonial parts of the Pacific region may discover some interesting patterns of that search for new politically neutral mining resource locations. But the developments reviewed here extended rapidly all over the LDCs during the 1960s. Consequently, it is possible to argue that the "new international resource order" started emerging long before the OPEC -- with the helping hand of oil transnationals -- did what it did in 1973.

In the face of the accumulated evidence it is not now possible to defend the proposition that the DCs have exclusive control of technology, capital and markets, while LDCs have only raw materials to dispose of. International mining corporations seem to be more aware of the changes occurring than the DC governments and academic theorists. This is why some corporations adopt much more accomodating postures vis-a-vis the LDC resource-holders, than do their own DC governments.

4. The New Economic Order

Previous observations lead to the question of the rationale of the "new international economic order" in respect to the resources sector, and its compatibility with the needs for international economic expansion. Many volumes have been written lately on this subject by both the "new order" proponents and its enemies. No agreement is in sight as yet. But perhaps the best resume of the political and economic rationale of that "new order" has recently been provided by an African public figure in the following words:

The New International Economic Order is about distribution: the distribution of world production, the distribution of the surpluses derived in any country and the distribution of economic power.

It is about the distribution of production because unless we in the poor countries can produce more of what we need ourselves and play a greater role in processing our raw materials into manufacturing goods before exports and unless the industrialized countries are prepared to admit our manufactures, we will remain unable to meet the basic needs of

our people...

...(It) is also about distribution of surpluses, because, unless we can retain the surpluses earned on the goods we produce, then we will remain poor and dependent no matter how much we produce...

Further, a New International Economic Order is about distribution of power. At present there are almost no significant formal or informal decision-making forums in which the Third World has an effective enough voice for its interests to be taken into serious account when decisions are formulated and agreed.¹⁰

This statement contains a clear message to the DCs in respect to the "new international resources order." First, LDCs are aware of their power to control physically a large part of the world's natural resources. Second, the domestic use of these resources and their processing before export should have priority over their export in an unprocessed state. Third, the LDCs aim at increasing their participation in the resource rent -- in the Ricardian sense -- from resources exploitation and trade.¹¹ Fourth, the LDCs have strong preference for negotiating the new international framework for future resource exploitation multilaterally rather than on a country-by-country or commodity-by-commodity basis.

Such messages should neither be surprising nor treated lightly as irresponsible nationalistic aberrations. These are messages of the rightful holders of an important and sometimes singular asset, willing to engage in negotiations about the form of its disposal taking into consideration their national interests. Giving priority to national interests over those of foreign parties is the primary rule of behavior applied by the DCs for some time. If the demand for general application of this rule feeds the image of scarcity and the sense of insecurity because it comes from the LDCs, then that is another story. Reactions are much calmer when the same position is taken by the countries such as Australia or Canada. As a matter of fact, resource nationalism originated in resource-rich but otherwise less opulent DCs and not in the LDCs, which are only late comers to the game.

Perhaps for all there is much more to the "new international resource order" than the search for a more equitable distribution of gains from resource exploitation and trade. If it had that single objective, the situation could easily degenerate into a very difficult zero-sum game. The LDCs posit, however, that the more equitable distribution of mining rent and profits would make sense for them only in a context of the dynamic expansion of the worldwide resource economy and of the reasonable stability of international resource trade conditions. Such a context changes the nature of the distributional issue into a non-zero positive sum game. Such games are played internationally all the time.

On the basis of their own historical experience the LDCs believe that the market alone cannot resolve the issues of international distribution of gains, economic expansion, and trade stability to the satisfaction of LDC policy makers. The "once-and-for-all" character of mineral exploitation, the presence of two different actors (a national state and usually a large foreign enterprise), the distinct locations of the asset and of its "final" disposal, imperfections of markets with a strong tendency toward oligopoly, and vertical and horizontal integration patterns of the resources industries are just a few of many elements that call into question the "fairness" of the market solution. The issues of steady resource output expansion and of price and income stability for the LDC resource holders can be resolved only by introducing some elements of international governmental action into the resource market.

Leaving aside the controversial issue of the secular trends in the terms of trade,¹² anyone cognizant of the problems of LDC social and economic management knows that the difficulties arising from seasonal and cyclical fluctuations in demand for exportable resources make such management extremely difficult, especially during the downswing of the cycle. Recent international agency attempt at financial compensation schemes for primary producers have not proven beneficial because such schemes not only are of limited magnitude but also act ex-post.

Under the "new international economic order" the LDCs would like to see the early establishment of the ex-ante price and incomes

stabilization schemes along the lines of the Keynes 1942 commodity plan.¹³ The LDCs believe, and are not alone in this respect, that there is a need for a world-wide long-run stabilization policy in the field of resource production and trade that would take into consideration conflicting interests of producers, traders and consumers.¹⁴ Such policy could be implemented, however, under real life conditions only if its designers and implementers -- governments and not private parties -- kept in mind that conflicts arise not only among producers, traders and consumers but among the objectives of growth, stability and efficiency as well.

Thus, the LDCs posit that a realistic global resource policy -- whether renewable or unrenovable -- would not substitute international public intervention for market allocation, as some people may think, but it would have to try hard to conciliate them. Such policy would not be able, as others believe, to assure the optimal achievement of any one of the three major overall objectives of growth, stability and efficiency in the mineral sector of the world economy. Clearly, it would not be even the "second best" policy. But as Solow wisely observed, with the "first best" policies absent from real life and the "second best" functioning in the resources field quite inefficiently, the risks involved in the attempt to implement what is possible are not too great.¹⁵

These are exactly the limited objectives pursued by the UNCTAD "integrated commodity program" supported by the LDCs.¹⁶ While it covers major foodstuffs and other agricultural commodities, some key world-traded minerals (bauxite, copper, iron ore, manganese, tin and phosphates) form its kernel. A growing number of DC policy makers have reached the conclusion that "the market for exhaustible resources might be one of the places in the (world) economy where some sort of organized indicative planning could play a constructive role."¹⁷ As a result there is room for cautious optimism about the future of the UNCTAD scheme. Since its adoption depends upon the political will to reach a compromise and not upon technicalities, it may alleviate at least some of the tensions that characterize DC/LDC resource relations. The DCs concerned with access to resources should keep in mind

that many measures taken by the LDCs in the past two decades to increase their share in resource rent and profits originated from fear of the insecurity of markets and from concern about price and revenue fluctuations.

It is worth noting that the initial hostility towards the UNCTAD "integrated commodity program" and its central support piece, the common stabilization fund, has been fading away in the DCs perhaps more rapidly than expected. Only three years ago the UNCTAD scheme was considered in many places either as some sort of "idiot's delight" or as a grandiose hoax that the LDCs wanted to perpetrate on the DCs for the purpose of destroying the "free market forces" through "financial subversion." Except for the indexation of commodity prices the subject is discussed seriously now both by DC scholars and policymakers.¹⁸

5. Contractual Resource Relations Between DCs and LDCs

While the DC concern with the worldwide extension of "resource nationalism" received strong stimulus from the so-called oil crisis of 1973 resulting in the subsequent debate on the "new international economic order," this in no way represented the watershed between the traditional and the innovative approach to the external exploitation of LDC natural resources. The departure from traditional practices had already started in the 1950s, accelerated in the 1960s and got the upper hand during the present decade. While old colonial forms of resource exploitation agreements still survive, they were gradually replaced all over the LDC world by new types of concessions. The most innovative aspects of these concessions consist of provisions, first, for the host country's participation in the ownership and, second, for its increasing management role in most phases of the resource industry including, in a few cases, marketing of the output abroad.¹⁹

The appearance of the modern resource exploitation concession was the result of a long sequence of slow and gradual changes in the nature of the traditional concession, based originally upon the grant of practically unrestricted rights (for half a century or more) to exploit

mining enclaves in a foreign territory. Under the "old order," royalties accrued to the LDC in accordance with the physical output volume or its estimated export price (a primitive production tax), accompanied sometimes by nominal land tax on the permanently leased mining property.

Even prior to the appearance of discussions in the DCs on such topics as the structure of international resource markets, the economic consequences of vertical and horizontal integration, transfer pricing and the like, the LDCs progressively abandoned the practice of relying on royalties as the main source of their resource income. This departure from past practices became quite extensive by the mid-1950s. It was a response first to the LDC growing realization that special characteristics of mineral resource development made it an economic activity considerably different from either export agriculture or the first stage of (consumer goods) industrialization. Empirical observations of different operational stages of the resource sector (from exploration to marketing abroad of final product), together with the growing awareness of microeconomic and technological implications of mineral development for the local economy, led to the emergence of policy measures aimed at progressive integration of the foreign owned and export directed resource industry enclaves into domestic development.

The measures taken -- individually or in packages -- at the speed commensurate with differing degrees of LDC skills and bargaining power included:

- (a) replacement of royalties by export taxes and/or income taxes, combined later in some countries with special "resource" taxation;
- (b) revision and tightening up of traditional incentives -- tax holidays, accelerated depreciation and depletion allowances;²⁰
- (c) local equity participation;
- (d) regulation of export-oriented resource infrastructure (railways, roads and port facilities);

- (e) contracting, management and marketing agreements;
- (f) joint processing facilities;
- (g) provisions for employment and training of local personnel, and
- (h) extension of local multiplier effects through local purchasing.

It is sometimes stated that production sharing and contracting arrangements originated in the early 1960s in Indonesia through the initiative of the European socialist countries and Japan to engage in production of agricultural commodities for export, and that only later they started covering nonrenewable resource exploitation. Recent studies suggest, however, that they appeared more or less simultaneously in many parts of the LDC world, including Latin America.²¹ They responded not only to the "resources nationalism" but also to technological changes in resources exploitation and to institutional changes in the structure of markets for final mineral products.²²

Most of the measures that appear in the modern contractual arrangements between the LDCs and the DCs may be broadly divided into financial provisions (such as increased royalties) and economic development provisions (such as promoting linkages with the rest of the local economy). Others, particularly those aimed at capturing an increased share of the resource rent, are being, tried, often with considerable success. Such is the case of the tax measures applied by the Caribbean countries in 1975 to aluminum transnationals within the framework of International Bauxite Association whose world-wide membership accounts for two-thirds of world bauxite reserves and mine output.²³

The implementation of the "new resource order" has been accelerated, not initiated, by the 1973 OPEC oil price action because that action in itself was a part and parcel -- albeit particularly visible -- of the long process of change and adjustment in the patterns of resources arrangements between the LDCs and the DCs. The OPEC success has inevitably brought to the forefront of the attention of mineral-producing nations other possible forms of cooperative action.

Its demonstration effect led to setting up the bauxite and the iron ore associations. These were looked upon prematurely by the DCs as the beginning of the new period of "resource cartels" that would bring havoc to the "free working of market forces" in the resource sector of the world economy.

The nervousness of the DC reaction was due to their lack of appreciation of a number of important facts. First, assuming generously that the "free market forces" did once operate in the resource sector they ceased to operate in the interwar period when world production and trade of key minerals became dominated by large oligopolistic corporations, in many cases substantially controlling not only supply but also demand. The most recent so-called resource cartels represented only the LDC countervailing response to these long-established oligopolistic situations. Their purpose was not to confiscate but to transfer an increasing share of the economic rents from these corporations to the LDCs. Second, while the patterns of global resource availability offer the base for only a few LDC mineral cartels,²⁴ these cartels -- if successful in raising prices above long-term market price trends -- would create a danger of encouraging exploitation of new or marginal deposits and in the longer run would defeat the cartels' objectives.²⁵

These producer associations are performing an extremely useful function from the viewpoint of the LDCs. These associations strengthen and make permanent earlier informal LDC information networks not only with respect to general world market conditions in specific resource industries but also with respect to the characteristics of individual production cum export arrangements in different countries. As mentioned earlier, the increased flow of economic and technological information from the DCs to LDCs through non-private channels prior to 1973 was largely responsible in the 1960s for the emergence of the resource development policy concepts in the LDCs and for their growing resource management capacity. While the post-1973 producer associations have been of limited use in cartelizing resources, they have been of considerable assistance in standardizing the LDC positions vis-a-

vis international corporations and the DC resource consumers. The role of information as the decisive input in policy formation, long appreciated by the DC private resources industry, has become recognized also by many LDCs.

Thus, the dynamics of the world resource situation, multiple factors underlying the LDC demands for the "new international economic order" in search for better equity, stability and expansion of the international resource economy, and the important micro changes occurring in individual arrangements and agreements between the LDC resource-holders and the DCs provide substantial evidence -- albeit still largely ignored in the DCs -- that the "new international resource order" has been more rapidly implemented than it may appear on the surface. Perhaps the continuous progress of its implementation has in part been responsible for the LDCs' pressure for accelerating the rate of change.

6. Concluding Remarks

This paper suggests that the traditional division of production factors in the resource sector with the DCs having exclusive control of capital, technology and markets and the LDCs having only non-renewable resources, has become progressively transformed, thus significantly altering the relative bargaining power of the parties involved in resource exploitation and marketing. This is particularly true with respect to technology (assuming technology covers all kinds of know-how) and markets. In the special case of oil the same can be said about capital.

This newly arising situation may complicate somewhat mutual adjustments between the LDC resource-holders and the DC resource-users but it will not make them impossible. Even under the conditions of the increasing technological capability and the LDCs growing domestic demand for resources, the LDCs cannot follow extremely conservationist policies. Since they badly need resource export proceeds for financing economic growth and sometimes also for participating in the international power game, the LDCs are little interested in a zero growth

strategy.

Throughout the present debate about the "new international economic order" the LDCs have demonstrated great interest in trading access to their raw materials -- under the new conditions of co-participation in most stages of resource development -- for access to DC markets. A competent observer of the world economic scene, sympathetic to the LDC position, remarked recently:

Outside a few possible special cases, such as oil, LDC bargaining power could best be employed in broadening and improving existing international resources markets; DC commitments regarding freedom of access to their markets and a gradual end of their protectionism must be the necessary price for their gaining access to LDC supplies.²⁶

Other observers expressed the belief that the necessary quid pro quo might be found on a lower and less politicized level. Thus, a 1974 U.N. report asserted that, in view of the desire of the non-oil exporting countries to achieve substantial and lasting improvements in the prices of their primary commodity exports, and in view of the DC need for an assured supply of essential raw materials and foodstuffs at reasonable and relatively stable prices, "there should be a common interest in broad supply commitments by exporters and purchasing commitments by importers" under a general commodity stabilization scheme.²⁷

Given the DC refusal to accept the principle of indexation, the trade-off between the access to resources and the access to markets does not seem possible. But the possible establishment of a weakened version of the UNCTAD "integrated commodity program" might be of considerable help in smoothing out the bilateral resource negotiations at the country or the enterprise level. What is hardly likely, however, is the acceptance by the LDCs, without changes of the Japanese schemes for resource development cum imports under long-term contracts. In inflationary times, such arrangements make little if any sense to the LDC resource holders, even if the contracts were to incorporate ex-ante the indexation clauses to which for obvious reasons Japan continues to be opposed. The lack of enthusiasm in the LDCs for such long-term schemes can be better understood if one recalls

recent remarks of a well-known U.S. authority on international trade that while "the fear of losing access to raw materials led some DCs to dream of reviving the special relationship with selected LDCs," the LDCs "have to gain from a multilateral market free of neo-colonial overtones."²⁸

Assuming the relatively speedy adoption of the integrated commodity program and some relaxation of quantitative trade restrictions applied to LDC manufactures and semi-manufactures under special preferential schemes, the question of the future shape of the bilateral resource exploitation arrangements between the LDCs and the DCs can be raised. In general terms they will follow the trends of the past 20 years, which were described aptly in the following terms:

...the new structures have broken the tight link between ownership, control, and financial risks and benefits that was inherent in the traditional concession. Arrangements have been negotiated that have repackaged these elements in ways not feasible under the old structures. Because ownership and control have become important political symbols in most developing countries, new contractual forms have been created to allow greater freedom in allocating ownership, control, and financial risks and benefits in ways that satisfy both the economic and new political imperatives. Where a foreign firm is considered important for its financial, technological, or marketing contributions, the new structures permit the negotiation of agreements that grant control and financial arrangements reflecting the bargaining powers of the parties. Ownership can be allocated in a way that makes the presence of the foreign firm politically acceptable in the host country.²⁹

Considering the relation between LDC resource holders and DC resource users, it is quite probable that major changes will take place in both resource exploration and in the marketing of the output.

The LDCs will pursue to an increasing degree the objective of putting resource exploration and evaluation in the hands of independent enterprises through the use of service contracts. The world-wide proliferation of sources of such know-how provides the LDCs with considerable opportunities in that field. Moreover, independent exploration represents the most convenient, and sometimes the only, road to obtain information needed by the LDCs for negotiating either

exploitation service contracts or joint exploitation arrangements. Decisions correct from the resource-holder's viewpoint on the terms of service contracts or on the equity participation in the exploitation cum export stage depend to a great extent upon the availability of correct information on the size, wealth and geological characteristics of new resource assets subject to bilateral negotiations.

There are two reasons for the insistence by the LDC resource-holders on local processing. First, the increased degree of local processing translates itself into balance-of-payments gains and savings to the domestic economy if it contributes to economies of scale in the domestic manufacturing industry. Second, it expands taxable profits through higher value added. The LDC demand for increased processing of resources at home may be met relatively easily by foreign mining corporations. Not only do they often have ownership links with the LDC industrial sectors but the trend towards a major degree of processing at source responds to their own interests in saving on labor and transportation costs.

Although the continuation of the trends in the LDCs toward joint ownership and/or management of nonrenewable resources for export can be expected, it is difficult to speculate about the concentrate formulae with respect to the degree of LDC financial involvement. While on political grounds the LDCs may continue to insist on majority capital participation, they are becoming more and more aware that capital ownership does not lead automatically to the real control of the enterprise. Capital scarcity together with other considerations may thus lead some LDCs towards tripartite arrangements involving the co-participation of local public and private capital along with that of foreign investment. In the more advanced LDCs, a limited financial presence in resource development may become attractive to local private industry, whether domestically or externally owned, both because it offers direct profits and also because it is the place in which important pricing decisions affecting the domestic industrial sector are made.

Of course, it is not easy to answer in advance whether the management of such complicated joint ventures will be easy. Their success will depend upon a satisfactory solution of numerous problems that arise with respect to management, technology, and the distribution of profits. The history of conflicts that arose within the joint U.S.-Japanese industrial ventures, established in Japan in the 1967-1975 period, suggest that most of them can be solved.³⁰

An increasing number of LDCs have lately adopted the position that technology transfers taking place exclusively through the foreign enterprise -- whether in resource industries or elsewhere -- do not offer a satisfactory basis for the establishment of domestic technological capability because they are unduly expensive in many cases and contain many clauses that restrict the use of that technology. Consequently, the LDCs will continue searching in all resource exploitation stages for unpackaged technology available from foreign private and public sources through alternative channels. This trend will be facilitated by the growing number of such alternative technology sources. With respect to pricing technology acquired in packages with foreign investment involving captive import of all capital goods, the major LDCs will press for the unpackaging of these transactions for negotiating purposes and for separately pricing different parts of the package in accordance with the market conditions prevailing in the DCs. The long-term objective here is to acquire technology from the DCs under the most favored-nation clause, that is, not to pay exorbitant premiums due to ignorance of international technology market conditions.

Finally, one can expect that all future bilateral resource contracts involving the LDC resource-holders will have to contain clear, unequivocal and fairly detailed general review clauses for the purpose of periodical adjustments to changing resource industries conditions, particularly in light of other subsequent agreements entered by the parties involved. These clauses may provide for periodical reviews every three to five years, and/or for emergency reviews in the case of pertinent world-wide or local developments. Moreover, the agreed

clauses may list all specific issues due for revision. The acceptance by the DC resource-users of such review clauses in all resource exploitation arrangements with the LDCs would go a long way toward minimizing conflict. Some internationally acceptable guidelines with respect to the behavior of international resource enterprises in the LDCs might be of help in getting rid of many conflicts that have characterized this sector of the world economy over the past 20 years.

FOOTNOTES

¹The politics and the economics of oil -- although highly relevant to the subject of this paper -- are not treated here.

²Tinbergen, Jan (Coordinator) -- Reshaping the International Order -- A Report to the Club of Rome, E.P. Dutton & Co., Inc., New York 1976 and The Future of the World Economy -- A United Nations Study by Wassily Leontieff et al., New York, Oxford University Press, 1977.

³Jan Tinbergen, op. cit., p. 255.

⁴For details see Wassily Leontieff, op. cit., pp. 44-49.

⁵By stating that "total resources are large enough to stagger imagination" the U.S. Society of Economic Geologists symposium adopted in 1972 a similarly optimistic attitude toward the problems of mineral wealth in the United States. See Eugene N. Cameron (editor) -- The Mineral Position of the United States, 1975-2000, Wisconsin University Press, Madison, 1973.

⁶As Robert M. Solow noted "our actual oligopolistic, politically involved, pollution producing resource industry is not exactly what the textbook ordered," Richard T. Ely Lecture, "The Economics of Resources or the Resources of Economics," The American Economic Review, May 1974, p. 1-14.

⁷"La negotiation d'une convention internationale a progresse" Le Monde, (Paris), July 17-18, 1977, p. 32.

⁸For details on the last point, see U.N. Mineral Resources Development with Particular Reference to the Developing Countries, New York, 1970. The document, published three years before the OPEC "disaster," reported that during the 1960s the UN has organized geological and mineral survey missions to over 50 LDCs, including such exotic places as Afghanistan, Burundi, British Solomon Islands and Madagascar, among others. While some missions failed to transmit knowledge, others succeeded.

⁹Miguel S. Wionczek, "Latin American Growth, Trade and Cooperation," Vierteljahresberichte (Bonn), No. 68, June 1977, p. 107-119.

¹⁰Amon J. Nsekela -- "The World Bank and the New International Economic Order," Challenge (Uppsala), 1977, No. 1, pp. 78-79.

¹¹The DC literature on this subject is not particularly voluminous. See, however, Solow, op. cit., and Helen Hughes, "Economic Rents, the Distribution of Gains from Mineral Exploitation, and Mineral Development Policy," World Development, Vol. 3, Nos. 11-12, 1975, pp. 811-825.

¹²As W. Arthur Lewis wisely suggests the solution of this issue should be left in the hands of economic historians. See his The Evolution of the International Economic Order, Research Program in Development Studies, Woodrow Wilson School, Discussion Paper No. 74, Princeton University, Princeton, N.J., March 1977 (mimeo).

¹³John Maynard Keynes, "The International Control of Raw Materials (1942)," Journal of International Economics, (London), No. 4, 1974, pp. 299-315.

¹⁴This point is emphasized in all UNCTAD literature on the subject. For details, see Alfred Maizels, "A New International Strategy for Primary Commodities," in G.H. Helleiner (editor), A World Divided -- The Less Developed Countries in the International Economy, Cambridge University Press, Cambridge 1976, pp. 31-52.

¹⁵Robert M. Solow, op. cit., p. 6-7.

¹⁶For the present position of the LDCs, the DCs and the socialist countries on the UNCTAD "integrated commodity plan" see Dragoslav Avramovic, "Commodities in Nairobi," Development and Change (The Hague), Vol. 8, No. 2, April 1977, p. 231-248.

¹⁷Robert M. Solow, op. cit., p. 13.

¹⁸For a comprehensive resume of these debates see Marina von N. Whitman, Sustaining the International Economic System: Issues for U.S. Policy, Essays in International Finance, Princeton University, Princeton, N.J. No. 121, June 1977.

¹⁹Smith, David N. and Louis T. Wells, Jr. Negotiating Third World Mineral Agreements: Promise as Prologue, Ballinger Publishing Company, Cambridge, Mass. 1975.

²⁰The evidence has accumulated the world over that such incentives are unnecessary and often expensive gifts to foreign mining enterprises. See Helen Hughes, op. cit.

²¹Smith & Wells, op. cit.

²²Scott, Anthony, "The Development of the Extractive Industries," Canadian Journal of Economics and Political Science, Vol. XXVIII, No. 1, February 1962, pp. 70-87.

²³For details see Malcolm Gillis and Charles E. McLure, Jr. "Incidence of World Taxes on Natural Resources with Special Reference to Bauxite," The American Economic Review, May 1975, pp. 389-396.

²⁴Marian Radetsky, "The Potential for Monopolistic Commodity Pricing by Developing Countries," in G.K. Helleiner, op. cit., pp. 53-72.

²⁵See Hughes, op. cit. and Lewis, op. cit.

²⁶Diaz Alejandro Carolos F., "North-South Relations: The Economic Component," C. Fred Bergsten and Lawrence B. Krause (editors), World Politics and International Economics, International Organization, Vol. 29, No. 1, Winter 1975, p. 277.

²⁷United Nations, Problems of Raw Materials and Development (Report of the Secretary General of UNCTAD prepared for the sixth special session of the General Assembly), New York, 1974, p. 16.

²⁸Carlos F. Diaz Alejandro, op. cit., p. 278.

²⁹Smith & Wells, op. cit., p. 52.

³⁰"Joint-Venture Problems in Japan," The Economist, (London), 14-20 May, 1977, pp. 100-101.

THE WIDER CONTEXT OF BILATERAL RESOURCE
EXPLOITATION ARRANGEMENTS BETWEEN THE LDCs AND THE DCs
A COMMENT

Romeo M. Bautista

Miguel Wionczek's stimulating paper consists of four connected parts, discussing major issues that underlie mineral resource exploitation arrangements between resource-rich less-developed countries (LDCs) and resource-deficient developed countries (DCs). The perspective taken is principally long-term and general, which I think has both advantages and limitations.

The first question raised -- whether the world economy faces a growing scarcity of mineral resources -- is only briefly discussed, the author relying on the highly optimistic findings of the recent Tinbergen and Leontief studies for his unequivocally negative answer.

The issue of access by DCs to LDC mineral resources is given historical interpretation in the paper. Wionczek draws attention to the rapid expansion of resources availability in the postwar period attributable to political and technological changes, the growing awareness among LDC governments of the potential benefits of mineral development for the national economy, the accompanying improvement in economic sophistication by resources policy managers in dealing with foreign private interests, the increasing capacity over the years of host countries to manage the financial and administrative aspects of mining operations, and the increasing scope for domestic use of mineral resources for processing before they are exported. The discussion is at once eloquent and forceful.

Coming from a country which has not yet attained the level of maturity in mineral resource development as some of the Latin American countries, I hesitate to accept the contention in this part of the paper that LDCs have at this time effectively taken the upper hand in

bilateral resource exploitation arrangements with DCs. In various countries in Asia and Africa today, one finds the situation perhaps similar to what Brazil, Chile and Mexico were experiencing two decades ago. The evolutionary pattern may turn out to be the same, in which case one could afford to be optimistic, but perhaps only in the long-term context. In the meantime there are problems, natural and artificial, faced by a LDC seeking to optimize the development of its mineral resources in collaboration with the large foreign enterprises.

Also, for some of these countries, the net benefits to the national economy of mineral resource development are not clear-cut. The inherent instability of mineral export prices (and hence earnings) is well known. The high capital intensity of mining operations seems incompatible with the capital scarcity and high level of labor force underutilization prevailing in the LDCs. While there are ways of overcoming the problem of obtaining capital, it is not necessarily good policy to invest it in mineral development projects, as investment in other areas involves much lower capital costs for each job created. The importance to the "general economic and social modernization process" of the "infrastructural aspects of mineral exploitation" emphasized in Dr. Wionczek's paper may also be questioned since minerals are usually found in remote areas and their development does not involve much interaction with the rest of the LDC economy. Thus, even for a resource-rich LDC, exploiting its comparative advantage in mineral development needs to be justified in terms of the extent to which the country's development interests are being advanced.

On the capital intensiveness of mining operations, it seems to me rather paradoxical, given the increasing control of LDCs in mineral exploitation (relative to the foreign enterprises), that little effort has been devoted to the development of alternative technologies that could have created more jobs. The economic viability of less capital-intensive mining processes merits serious investigation, in view of the favorable findings of past ILO studies on the cost effectiveness (based on shadow pricing of inputs) of labor-intensive techniques in road construction and other public works. Perhaps this is one area in

which the growing influence of resource-rich LDCs in mineral development could be brought to bear.

In the discussion of what he calls the New International Resource Order, Wionczek rightly emphasizes the need for a continuing expansion and reasonable stability on international resource trade, even as LDCs strive for a greater share of the gains from resource exploitation. For various reasons having to do with market imperfections, these objectives could best be served, according to Wionczek, by international governmental action through the UNCTAD "integrated commodity plan." While I share his cautious optimism about the future of the UNCTAD scheme, my feeling is that it will be implemented, for better or worse, in a substantially modified form. Perhaps Wionczek, who is probably the most knowledgeable in this group on the recent NIEO negotiations, could share with us "academics who are one year behind current developments" (quoting from his earlier oral remarks) more detailed information than has been provided in this paper.

The succeeding sections in the paper give an excellent survey of the rapidly changing contractual arrangements in mineral exploitation and trade worked out by resource-rich LDCs with foreign enterprises in the last two decades. As old agreements come to end, or more often were renegotiated, new terms much more favorable to the host countries tended to replace the original arrangements. These concessions mainly took the form of increasing LDC participation in ownership and management of the resource industry. The discussion gives convincing evidence that long before the 1973 OPEC action there have been concerted efforts in the past by major LDC mineral producers to promote their common interest. Again, one wishes that Wionczek had been less general in his assessment of the effectiveness of LDC mineral cartels which certainly varied across different groups.

On the increasing flow of economic and technical information facilitated by the establishment of producer associations, I fully agree that such access to information is most important to policy-making, in view of the alternative opportunities facing the host country with respect to prospective foreign contribution to the financial, technological and managerial requirements of its mineral industries. It is only when the LDC policymaker has knowledge of the

various options available that confidence could be acquired in taking decisions and dealing with the individual elements of private foreign interests. For LDCs relatively less experienced in mineral resource development, a very high payoff attaches, I think, to a close relationship with the more mature LDCs, such as the Latin American countries, that could provide such information channels.

Related to this, it seems reasonable to state that the principal cause of the inability of LDCs to obtain a fair share of the benefits from mineral resource development in the past has been their lack of knowledge about their collective bargaining strength and available options in policymaking. As Wionczek's paper demonstrates, the situation has changed substantially over the years. The burden now is on LDC governments to insure that policy formation concerning mineral resources is geared to the promotion of national development objectives.

THE WIDER CONTEXT OF BILATERAL RESOURCE
EXPLOITATION ARRANGEMENTS BETWEEN THE LDCs AND THE DCs

H. Edward English

Miguel Wionczek asks four questions:

1. Is there a growing mineral resource shortage?
2. Is access to mineral resources a problem for developed countries?
3. Are LDC demands in conflict with general objectives of the world market.
4. Are present contractual relations likely to lead to continuing tension?

The answer is a qualified "NO" to all these questions but more conditional access is likely to be characteristic of the future, and changes that are underway already are hardly revolutionary. Even Wionczek sounded more revolutionary a few years ago at the Sixth Conference on Pacific Trade and Development in Mexico City. But after all the New International Economic Order was and is mainly a means of attracting the developed countries' attention to the needs of the third world.

One must then proceed to examine the basis of the answers Wionczek gives to the questions.

To deal with the first question he calls on the Leontieff (1977) and Tinbergen (1976) reports. Although Leontieff, being the coordinator of a U.N.-sponsored study, takes a more "Club of Rome" ish stand than Tinbergen, both leave little doubt that non-renewable resources are likely to last us a long while yet. And Wionczek throws in the "U.S. Society of Economic Geologists" symposium of 1972 to add further confirmation of the positive resource forecast.

Turning to the second question, what changes are occurring in conditions of access to non-renewable resources, the central issue is what changes are occurring in the market for such resources? Is there

still a demand curve a supply schedule, and is there more or less competition in the way demand and supply are brought together? As an industrial organization economist, I have watched with a mixture of amusement and impatience as the macro-economists and even international trade economists have slowly learned over the past thirty years that in some important markets there are now and always have been substantial departures from pure competition. That is why one can be impressed with the brevity but not the originality or precision of the quotation from Solow in Wionczek's footnote (from the Ely lectures of 1973). "Our actual oligopolistic politically-involved, pollution-producing resource industry is not exactly what the textbook ordered." That depends, in part, whether one is referring to Samuelson (first few editions) or to Pigou and Bain (which date from the 1920's and 1950's).

What is not new is the existence of oligopoly or pollution. They existed in approximately the same sectors in the 1950's as they do now. The only important changes in the last thirty years relate to (1) the recognition by more governments that social costs and benefits must be taken fully into account -- thus leading to greater participation by states (mainly developed states) in setting the terms on which resources may be produced; and (2) the creation of developing countries out of colonies leading to new definitions of social priorities no longer based on those of a few imperial powers or the enterprises that they foster.

Wionczek also places great stress on the proliferation of resource development and of channels for its dispersion. I think he places somewhat too much emphasis upon this factor. However, the existence of the LDCs as independent countries, and their greater stress upon acquiring and dispersing managerial skills, has led to their greater capacity to define their interests in the development of these non-renewable resources and to bargain more effectively with the enterprises that previously had a greater advantage in know-how. In sum then, on the second question, the conditions of access are changing but they are basically related to a higher and more dependable price for the LDCs.

This leads to the third question: How if at all are the new conditions likely to be in conflict with the general world economy objectives? Since the objects of the N.I.E.O. are redistributive, the answer in principle is simple: "not at all" unless the redistribution critically reduces incentive or distorts the pattern of incentives. But there is a confusion in the interpretation of the redistributive principle. It is often stated as the distribution of production, or of surpluses, and of economic power. "...unless we in the poor countries can produce more of what we need ourselves and play a greater role in processing our raw materials into manufacturing goods before exports and unless the industrialized countries are prepared to admit our manufactures, we will remain unable to meet the basic needs of our people..." It becomes apparent that there is a real danger that equitable distribution of the world's income can be lost in nationalistic rivalry, even among development countries, to retain control of the full value added. This statement could lead to much inefficiency in resource allocation since the efficiency of processing of every resource must be assessed on its merits (with a view to long-term comparative advantage prospects) for each individual developing country.

The discussions of distribution of surpluses and of distribution of economic power are also less than precise. However, it is possible to recognize a number of changes in market conditions that are compatible with both legitimate redistribution and efficiency-promoting objectives, e g., the equal access to processing know-how, the elimination of DC trade restrictions that discriminate against processed forms of natural resources, the improvement of multilateral, regional and product-specific commercial institutions.

I do not reach quite the same judgements that Wionczek does. He speaks of LDC awareness of their power, "to control physically a large part of the world's natural resources." I see little evidence yet of the reality of that power, except in OPEC. Again, I do not think one should generalize about the priority of processing. I am not sure that the LDCs have or should have a strong preference for negotiating the new resource sector deals on a multilateral basis because there are far

too many of them to form a strong front as a collectivity. Regional or commodity groups or package deals are at least as likely to produce results favorable to the LDCs, as OPEC surely demonstrates.

A key statement which Wionczek makes is the following: "giving priority to national over external interests is the primary rule of behavior applied by the DCs for quite a time." This applies also to the LDCs, especially the larger ones. The recognition of overriding group interests is only strong where the members are very small or the group interests are very substantial, again citing OPEC as an example.

Moving to the specific forms of bilateral institutions, Wionczek places emphasis upon price and income stabilization schemes. He makes a rather ambitious generalization on this point: "Such policy could be implemented, however, under real life conditions only if its designers and implementers -- governments and not private parties -- kept in mind that conflicts arise not only among producers, traders and consumers but among the objectives of growth, stability and efficiency as well." The UNCTAD, "integrated commodity program" is his prime example of a bilateral acceptance in DCs. However, it is not yet certain whether it is practical to move ahead on as many as six commodities at once. Provided that one does not undermine the long-term allocation process with indexation, there is no harm in trying for a six-commodity deal (bauxite copper, iron ore, manganese, tin and phosphates). The major disadvantage of such an approach is that it substantially enlarges the number of producing countries that must coordinate their efforts, and the possibility of divisions among them becomes greater, weakening their bargaining power relative to the more common consumer groups. When Wionczek turns to a discussion of the financial and economic development provisions of the individual bilateral mineral development deals that involve LDCs as suppliers, he rightly identifies as a gradual evolution the growing acceptance of host country participation in ownership and an increased managerial role. Furthermore, he notes the gradual shift away from financial terms that reflect the uninformed and competitive bidding for investment by LDCs -- token royalties, tax holidays, accelerated depreciation and depletion allowances.

Among the development provisions he highlights regulation of export-oriented infrastructures previously built and controlled in the interest of the private investor alone, and also the unbundling of the managerial package, and the specification of arrangements for management and marketing services, joint processing facilities, training of local personnel, etc. I see this process as an essential probing to identify the strengths and weaknesses of the developing country's capacity to manage its affairs. I do not think it should be criticized if in the short run it results in less efficient operation of the industries concerned, provided that there are means of assuring that local capabilities are being developed and skills dispersed. That often depends most of all on the capacity for evolution of local political and social institutions and the conditions that constrain access to national elites.

Wionczek rightly identifies the problems that can and do arise if this evolutionary process leads simply to more cartels. Apparently the participation of government enterprises is no guarantee to the stability of copper prices or the limiting of excessive incentives to marginal producers.

It would have been helpful to have in the paper a systematic review of bilateral arrangements so that we could make judgements on the relative importance of the problems that emerge in the new phase of bilateral bargaining, but it is unfair to expect Wionczek to produce such a compendium in what is already a comprehensive and very useful paper putting a much needed perspective on the faddish notion that the new economic order is the source of all acceptable ideas about the betterment of mineral and other resource development contracts. Such ideas were already rooted in the events of earlier post-war years.

As Wionczek also emphasizes, the best guarantee that the LDCs will not be unreasonable is the fact that they are the "last group of countries interested in the zero growth strategy."

THE WIDER CONTEXT OF BILATERAL RESOURCE
EXPLOITATION ARRANGEMENTS BETWEEN THE LDCs AND THE DCs
GENERAL DISCUSSION

The discussion began by one participant noting that perhaps one way to get a picture of the developing countries' position with developed countries is to combine the views of someone from a Latin American developing country with those of a person from an Asian LDC and divide by two

Despite relatively greater earnings stability, stabilization is more an issue to Latin American than to Asian mineral producers. The question of just how important stabilization is compared to other issues was raised. There is some controversy as to its economic benefits, even if it were politically accepted. Partly this pertains to costs of approaches: the use of buffer stocks was said to be a fraction of the cost of more direct stabilization even if swings were allowed in the 10 to 15 percent range.

If stabilization is felt to have such a large payoff to developing countries, the question was asked what they might trade off for it since all LDC demands are unlikely to be met. Indexation of the moving-peg variety was suggested with major market changes being reflected in the real price, rather than a rigid relative price system.

It was suggested mineral suppliers have not actually increased the real costs of access to industries using the mineral. Historically, access costs accrued to some imperial power; now they go to the producing country. Perhaps too much is being made of developing countries having had much impact on markets from what is called tougher bargaining.

On a related note, the use of the terms rents and profits was questioned. Since it was felt the author does not mean host countries should take equity positions and reap profits therefrom, but rather should simply obtain all the rent they can, it might be better to speak

of rents and partial rents.

It was pointed out the standard resource-availability studies do not use an appropriate methodology for the task: input-output tables are static, and the environmental impact is not typically considered.

The author is optimistic about long-run resource availability, yet is also concerned about investment being made to exploit minerals

Whether mineral producing countries should obtain exploration expertise provoked some disagreement. It is the highest risk part of the mineral exploitation game, and as such it is better to leave it to private multinationals who can spread that risk over many projects internationally, especially since there are some differences in techniques and requisite expertise for different minerals. On the other hand the author noted such firms do not always disclose their findings fully, placing the host country at a bargaining disadvantage. However this is not necessarily a real problem since rents forgone from lack of initial information can be recovered as the resource is mined; it is more difficult to misrepresent output than still-unrecovered minerals.

It was observed that long-term supply contracts are really simply agreements to continuing negotiations as conditions change, and in that sense are like direct investments. Another speaker wondered why the author specifically labelled Japan's long-term contract proposals as "hardly in the cards."

INTERNATIONAL COMMODITY CONTROL -- THE TIN EXPERIENCE

Mohamed Ariff

The world has so far witnessed eight international tin agreements, four in the pre-war period beginning in 1931 and four in the post-war period since 1956. The fifth post-war international tin agreement has been provisionally in force since July 1, 1976. The objective of the present paper is to examine the nature and functions, scope and limitations, and practical difficulties and outcomes of these international tin control schemes.

The paper consists of three sections. The first section provides a brief historical sketch of the tin agreements as a prelude to the discussion that follows. The second section evaluates the preformance of tin control schemes, while the third section analyzes some of the issues associated with tin control and draws some policy implications.

Section 1.

Pre-war Agreements

The first international attempt at tin control was made in 1921 when the tin prices were rapidly declining as a result of a recession in industrial countries, exacerbated by the huge stocks accumulated during the First World War due to shipping difficulties. The situation was serious enough to lead the British and the Dutch governments to form the Bandoeng Pool with the aim of removing the surplus stocks from the market. The stock pool successfully withdrew about 19,000 tons of tin from the market, thereby raising the prices above 165 per ton, and it was only in 1923 that the pool began to release the stocks gradually without upsetting the price level.

By 1922, world tin consumption had not only recovered, but also begun to overshoot production leading to soaring prices which reached

£321 per ton in 1926. Excessive optimism caused an investment boom in the industry, and overproduction unfortunately coincided with the world depression at the end of 1929.¹ The average tin price fell from £142 in 1930 to 118 in 1931. The Tin Producers' Association made two unsuccessful attempts at voluntary restrictions in Malaysia in 1930 to reduce output by shutting down half the industry for two months. The panic caused by the deteriorating situation led the governments of the main producers (the Federated Malay States, the Netherland East Indies, Nigeria and Bolivia)² to sign what became the first International Tin Agreement (ITA) which came into operation in March 1931. The ITA sought to restrict exports through an inter-governmental quota system. Each member country was allowed a percentage production quota based on the 1929 standard tonnage. The export quota was initially fixed at 78 percent of the standard tonnage but was soon lowered to 33.3 percent. Severe restrictions helped the ITA maintain tin prices above the 1930 level.

The scheme was renewed in 1934 to run for an additional three years. Aiming at greater monopoly control, the second Agreement offered lavish quota incentives for new entrants.³ The entry of the Belgian Congo, Cornwall, French Indo-China and Portugal raised the monopoly power of the ITA from 74.9 percent to 84.6 percent. The objective of securing "a fair and reasonable equilibrium between production and consumption with the view of preventing rapid and severe oscillations of price" was retained, but the Agreement was apparently committed to maintain tin prices above £200 per ton.

The third ITA was from 1937 to 1941. During 1936-37, tin prices rose and export quotas were relaxed and kept at 100 percent of the standard, with restriction being virtually removed in 1937. However, by mid-1938 when tin prices fell rapidly, export quotas were reimposed at 35 percent of the standard. The fourth ITA, which was supposed to have run for another five years, was interrupted by World War II.

The Agreements used quantitative restrictions as the main control device, although buffer stock operations also contributed to the control mechanism. Between 1931 and 1941 four buffer pools had been in operation, initially on a private basis but later on an official basis

as adjuncts to the Agreements. The objective of the first private buffer stock established in 1931 and operated in conjunction with the ITA, was the disposal of surplus stock and not price stabilization. As a part of the second ITA, an official price-stabilizing buffer stock was set up in July 1934 and was operative through 1935. Stocks exceeding 8,000 tons were obtained by a special 5 percent addition to the export quotas which were then at 40 percent of the standard. Another official buffer pool with 10,000 tons was established in mid-1938 and the stocks were disposed of in 1939 when the war scramble started.

In the first two ITA's, an important feature was the conspicuous absence of consumer representation. It is therefore hardly surprising that the industrial consumers, especially the American manufacturers, registered strong resentment to output restrictions aimed at raising prices. The largest consumers, the United States and Britain, were then allowed to participate in the Council discussions with no voting rights under the third and fourth schemes.

Post-war Schemes

The post-war tin era started off with historically high demand and high prices. Production had been exceeding consumption since 1949, but the excess was absorbed by the U.S. strategic stockpile. Under the Korean-war boom, tin prices rose sharply from an average of £606 per ton in 1949 to an average of £1,077 in 1951. Even in 1953 the average price remained at £732 which was much higher than it had ever been before the Korean War. Yet, the future looked gloomy, since the U.S. stockpiling was nearing saturation by 1953, and tin consumption appeared to have been permanently reduced by economizing processes devised during the war and immediate post-war years. In short, a potential "burdensome surplus" was threatening.

The International Tin Study Group (ITSG) was established as early as 1947 under the U.N. Havana Charter. The attempts by the ITSG to set up an international tin scheme were thwarted by the Korean-war boom and the U.S. attitude of "benevolent neutrality." At last, in June 1954, the first post-war ITA was signed by all the major producers and

consumers with the conspicuous exception of the United States, Japan and Germany. Membership now covered 88 percent of world production and 37 percent of world consumption. Ratification by Indonesia was, however, delayed until February 1956 and the Agreement came into force only from July 1, 1956.

The Agreement appeared to depart radically from the pre-war schemes not only in terms of its objectives but also with respect to consumer interest and control methods. The objectives were briefly:

- (a) to eliminate excessive price fluctuations;
- (b) to secure long-run supply and demand equilibrium;
- (c) to ensure adequate supplies at reasonable prices;
- (d) to avoid large-scale unemployment and underemployment in the tin industry; and
- (e) to promote economic production and prevent waste of tin deposits.

Equal consumer representation was provided in the sense that the producing and consuming countries were to have equal voting power -- each side having in the supervising International Tin Council 1,000 votes to be allocated among members in proportion to their shares in production and consumption⁴. As in the pre-war schemes, exports restrictions and buffer stock operations were the two methods of control, but unlike the pre-war arrangements, the buffer stock was assigned a key role. A buffer stock equivalent to 25,000 tons was established with contributions of tin and/or a cash equivalent from the producing countries. While metal contributions were not to exceed 75 percent of the total, the producing countries were encouraged to pay 100 percent cash at the floor price of £640 per ton (the market price on July 1, 1956 was around £750).

The buffer stock was under the control of a manager subject to certain regulations. The official price range was fixed with £640 as the floor and £880 as the ceiling and was divided into three parts: the top third range (£800- 880), the middle range (£720- 800), and the lower third range (£640- 720). The buffer stock manager was obliged to sell tin when the price rose above the ceiling, to buy tin when the price fell below the floor, and not to buy or sell in the middle range

unless the Council decided otherwise by a weighted simple majority vote. Export restrictions could be improved only after a minimum of 10,000 tons of tin had been accumulated in the buffer stock.⁵ It was only in this sense that export restrictions played a secondary role in the mechanics of the first post-war ITA. The export quota was to be allocated among the producing member countries in proportion to their market shares.⁶ The penalty for a breach of the quota limits ranged from additional contributions to the buffer stock equivalent to the excess exports, to the loss of 50 percent of the country's share in the buffer stock.

The scheme was put to the test immediately after its birth. The Suez Crisis caused tin prices to overshoot the ceiling of £880, but the buffer stock was impotent to act as it had no metal to sell. In 1957 the Council raised the floor price from £640 to £730. Huge buffer stock purchases were made in the second half of 1957 when the price fell to the new floor as a result of declining consumption and increasing Russian tin exports.⁷ The second and a part of the third instalments of buffer stock contributions were called up, and a severe export restriction was imposed. The crisis repeated itself in January 1958. To save the situation, the Council called up the remaining buffer stock instalments, appealed for voluntary contributions and tightened export control. Despite all these moves, the price broke the £730 floor plunging to £640 in September 1958, but soon returned to the floor level.⁸ Throughout 1959, the price remained fairly stable around £790 per ton. The metal buffer stock was reduced to 10,000 tons, and export controls were relaxed and finally removed in September 1960. After March 1961, the price rose rapidly unchecked by the buffer stock sales. Stocks of tin in the buffer stock were exhausted in June 1961, allowing the price to break the ceiling of 880. The first post-war ITA expired on June 30, 1961.

The second post-war ITA was operated provisionally from July 1961 and definitively from February 1962 for a period of five years. There were only minor changes in the new scheme: (1) the U.S. and U.S.S.R. still declined to participate, although Japan and Mexico joined by late 1962; (2) the floor and the ceiling prices remained at £730 and £880,

respectively, although they were subsequently raised a number of times; (3) quantitative controls and buffer stocks remained as the control weapons, although it was now possible to impose export restrictions if the buffer stock held 5,000 tons instead of 10,000 tons as previously; and (4) the maximum size of the buffer stock was reduced from 25,000 tons to 20,000 tons, but the buffer stock manager was now empowered to borrow money to expand his market operations under specified circumstances.

During the early 1960's, world production and consumption of tin were generally stable with consumption exceeding production by about 10,000 tons. Even the American release of about 32 000 tons of tin from the strategic stockpile⁹ between August 1962 and September 1964 did not restrain the price from rising. The buffer stock was again powerless to prevent the price from breaking the ceiling of £1,000 in October 1964 to reach a peak of £1,655. In November 1965, the floor price was elevated to £1,000 and the ceiling price of £1,200. During the greater part of the second post-war control period (1961-6) the buffer stock was not active, and when the second post-war agreement came to an end on June 30, 1966, it accounted for a holding of £19.27 million entirely in cash.

The third post-war agreement came into force provisionally in July 1966 and definitively in March 1967. Under the new scheme, a provision was made for a buffer stock of £20 million, equivalent to 20,000 tons of tin metal at the floor price of £1,000 per ton, and for an overdraft not exceeding £10 million on commercial terms from a bank consortium in London, thus raising the resources of the buffer stock to £30 million. The buffer stock price range was raised at the beginning of the third agreement from £1,000- 1,200 to £1,100- 1,400. In November 1967, following the sterling devaluation, the floor and the ceiling prices were increased by one-sixth to £1,283 and £1,633 respectively. A third change in the official price range was made in 1970, but not for currency reasons, the floor price being raised by 7 percent and the ceiling price by 3 percent. In the process, the middle sector of the price range was narrowed down from 10 percent (of the floor price) in 1964 to less than 6 percent in 1970.

The third agreement had a relatively easier time. The highest surplus of production in any year was 7,000 tons, and the biggest shortage 5,000 tons. Export control was introduced rather strangely while the buffer stock was still selling, and was in operation during 1968-69. The buffer stock manager was given (as in 1957-60) the authority to sell in the middle sector in order to prevent export control from raising the price too rapidly. It is also of relevance to note that Canada, United Kingdom and Japan expressed concern over the high level of tin prices and emphasized the dangers of substitution by other metals.

The fourth agreement was in operation for five years from 1971, with no change in the basic principles of export control and buffer stock. A significant development was that the International Monetary Fund (IMF) allowed its members for the first time to use their drawing rights to make the greater part of their contributions to the tin buffer stock, a facility which was promptly made use of by Bolivia, Indonesia, Malaysia and Thailand. To make the buffer stock more palatable to the IMF, the new agreement introduced a major change in the buffer stock mechanism by permitting the excess cash in the buffer stock to be distributed even before the end of the agreement. The buffer stock manager was now obliged to sell at the market price when the market price was at or above the ceiling price, thus departing radically from the previous practice of selling only at the ceiling price. Another development of considerable significance was the consumer contributions to the buffer stock for the first time, amounting to a total of 1.8 million by the Netherlands and France in 1972.

In July 1972, the Tin Council changed its price range from the sterling basis to a Malaysian dollar basis, when the pound sterling shifted from a fixed to a floating rate. This was effected merely to take advantage of the relative stability of the Malaysian dollar.

There was a threat of a surplus in 1972 following increased tin production in Australia and Indonesia. Consequently, export controls were imposed in January 1973, not to reduce output but simply to prevent further increase in output. When the price of tin rose above the ceiling the September 1973, the Tin Council reacted by abandoning

the export controls and shifting the price range of accomodate the new market prices. It must, however, be pointed out that in 1973 tin prices reflected not demand and supply situations, nor production and consumption conditions, but simply the weakness of the pound sterling and the U.S. dollar. Apart from these, the story of the fourth post war tin scheme was not substantially different from that of its forerunner.

There was a sharp turnaround in the tin market towards the end of the fourth agreement period and the buffer stock disposed of 16,809 tons of tin in the second quarter of 1976, reducing the metal stock to 2,822 tons which was then transferred to the buffer stock of the fifth agreement.

The fifth post-war international tin agreement provisionally came into existence on July 1, 1976. The reluctance of Bolivia, the world's second largest tin producer, first to sign and later to ratify the agreement has pre-occupied the Council ever since. Bolivia has apparently demanded higher prices for tin to match its higher production costs, as a condition for ratification of the agreement. The fifth agreement was to have entered definitively into force on December 31, 1976, which was subsequently postponed to June 30, 1977. It is of interest to note, however, that voluntary contributions to the buffer stock have been made by Belgium, Canada, Denmark, France, the Netherlands and the United Kingdom.

The fifth tin agreement era started off with rising prices in July 1976, and the buffer stock having disposed of all its metal by mid-January 1977 was unable to keep the price within the official range. It has been estimated that there is presently a shortage of 15,000-20,000 tons a year which would exert upward pressure on tin prices.¹⁰

Section 2.

The Character of International Tin Control

International tin control schemes, especially the pre-war ones, suffered or enjoyed ambiguity of objectives. Even the post-war schemes

displayed their objectives only in rather general terms. Nevertheless, it had always been fairly obvious that the price objective was the most important in all the tin agreements. It now appears in retrospect that the international tin control schemes have tended to adopt a price policy of opportunism or expediency; even the well-defined ceiling and floor prices were of mere academic importance, as experience has repeatedly shown.

Historically, international tin control had been construed as a weapon against "burdensome surplus" with which catastrophic price falls were usually associated. The implicit primary objective of tin control was to raise tin prices through output restrictions, although it had never been clear as to what level the prices were to be raised.

In the absence of "burdensome surplus" international tin controls have been sustained mainly by the objective of price stabilization. The degree of price stability aimed at was given by the official buffer stock price range, although the price range itself was subject to frequent adjustments. Other objectives, spelled out in the preambles of international tin agreements, were not necessarily related to the declared price objective. In particular, the employment objective of preventing large unemployment and underemployment in the tin industry was not consistent with severe output restrictions which were designed to raise prices.

There has been an unmistakeable shift of emphasis from price stabilization as a benefit to the producers and consumers of the commodity to price stabilization as a benefit to the producing countries' national economies. Commodity control is also increasingly looked upon as a powerful instrument of effective aid from the richer consuming countries to the poorer primary producing countries through commodity prices stabilized at the highest possible level.

International tin control partook of the character of a producers' cartel especially in the initial stages. "Equal" consumer representation was formally built into the post-war agreements in conformity with the U.N. Havana Charter but this did not change its basic orientation toward producers. The accent on producing interests has remained because the consumer representation at the Tin Council has

often been influenced by international political considerations rather than strictly guided by consumer interests.¹¹

A few examples suffice to illustrate the extent of producer-bias built into international tin control. First, the quota weapon was not double-edged in the sense that supply responses to quota variations have tended to be asymmetrical: the imposition or tightening of export restrictions would become almost immediately effective in raising prices during a surplus, whereas their removal or relaxation would be feeble in restraining price increases during a shortage, since the time required to recognize factors of production would delay supply responses to quota releases. Second, penalties for exceeding the quota were prescribed in the post-war agreements with no similar deterrent against failure to fulfill the quotas. Third, the buffer stock provisions were heavily skewed in favor of producers in that the buffer stock operations were powerful in checking price falls and weak in controlling price increases. Ceilings were imposed on metal contributions to the buffer stocks, but not on cash contributions. Indeed, an incentive to contribute cash rather than metal was present in the provision that cash contributions need be made at the official floor price and not at the ruling market price which was almost always higher. It is therefore hardly surprising that cash contributions were the rule rather than the exception. The implications of this were detrimental to the consumers, since the buffer stock would have large cash reserves to mop up excess supply and little or no metal to meet excess demand especially in the initial phase. Fourth, quota cuts were permissible whenever metal in the buffer stock reached a certain stipulated level (10,000 tons in the first post-war scheme, and 5,000 tons in the subsequent schemes) -- a provision which the producing interests have not failed to take advantage of; but there was no similar built-in formula for relaxing quotas. In summary, the objective of protecting consuming interests by ensuring "adequate supplies to tin at reasonable prices at all times" has remained dubious, not only because the concept of "reasonable" prices is too nebulous to be of any practical significance, but also because no effective measures have been prescribed to reduce production costs and to improve the

overall efficiency of the tin industry.

The Effects of Tin Control

The performance of the control agreements may be gauged against two basic criteria: the size of surpluses and the degree of stability. The first criterion evolves from the role of international tin controls as a weapon against "burdensome surplus," while the second criterion stems from their role as a stabilization device.

Judged by the first criterion, international tin control schemes generally appear to have been fairly successful. Severe export restrictions and appropriate buffer stock measures had helped to alleviate situations of excess supply in world markets, thereby enabling the price of tin to recover from depressed levels. The above overall statement, however, needs some qualification with respect to the performance of individual schemes. The first ITA must be given credit for fighting the crisis and raising the price of tin from the dismally low level of 1930, but the subsequent pre-war tin control schemes had relatively easy times, for tin consumption began to recover from 1934 onwards, culminating in the general raw materials boom of 1936-37. The third pre-war ITA, however, experienced some difficult times as a result of the mild American recession before the outbreak of World War II, but managed to prevent prices from falling too low by means of tight export controls.

The post-war tin agreements were indeed overly successful, for they transformed potential burdensome surplus situations into what may be termed as actual acute burdensome deficit situations. The post-Korean-War history of tin has been largely one of lagging production and expanding consumption. Indeed, tin has suffered almost as much from shortages as from surpluses. During 1901-1976, there was excess production of tin in 39 years and excess consumption of it in 36 years (Table 1 and Figure 1).

According to the second standard, that is the stability criterion, the performance of the tin control schemes have not been all that impressive. It, however, cannot be denied that tin prices have been relatively stable under the control schemes, compared with control

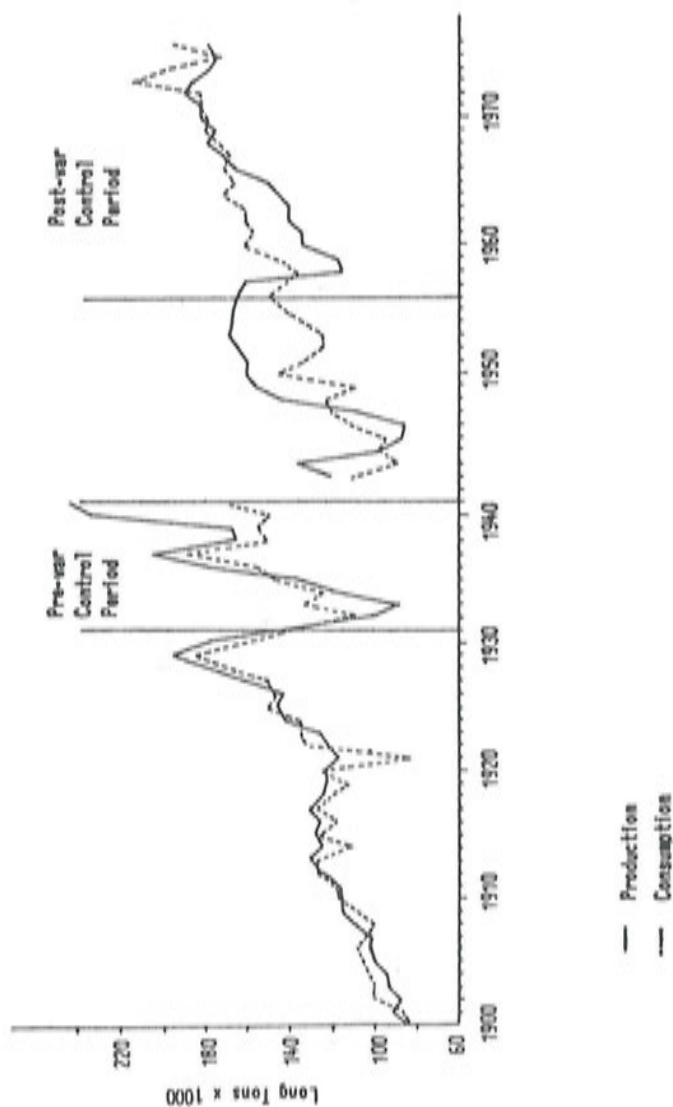
TABLE 1

EXCESS PRODUCTION AND CONSUMPTION OF TIN
IN NUMBER OF YEARS, 1901-76

Period (inclusive)	Production Excess	Consumption Excess
1901-12	3	9
1913-20	7	1
1921-31	7	4
1932-35	0	4
1936-41	6	0
1942-47	2	4
1948-57	10	0
1958-66	0	9
1967-76	4	5
Total 1901-76	39	36

FIGURE 1

PRODUCTION AND CONSUMPTION OF TIN 1900-76



free periods. But, post-war tin agreements have displayed an inability to contain prices within the ruling official price range. Although they have succeeded in preventing prices from breaking the floors, they have failed in preventing prices from breaking the ceilings. (Figure 2) Instead of actively reacting to price increases, they have in fact reacted passively by adjusting the official price range to follow the new market price. During the period of the first four international tin agreements, the official price range was changed thirteen times; once in the first agreement, three times in the second agreement, three times in the third agreement and six times in the fourth agreement, as shown in Figure 2.

A comparison of the extent of oscillations in day-to-day prices and in year-to-year average prices would suggest that the price range was relatively smaller during control years than during control-free years. This impression is especially valid if we exclude the 1964-65 period when speculation about U.S. strategic stockpile releases had destabilizing effects on tin prices. The post-war agreements appear to have been more successful than the pre-war agreements in smoothing out short-term price fluctuations (Table 2).

Ironically tin controls have tended to destabilize output, employment and export proceeds. There is evidence to show that quota variations under the tin control schemes have made output and employment in the Malaysian tin industry rather volatile. Furthermore, because the elasticity of demand for tin exceeds unity over the business cycle, export controls have rendered Malaysia's tin export proceeds rather unstable, with price stability being more than offset by export volume instability.¹² Any reduction of price instability achieved by tin control has been overwhelmed by excessive fluctuations in the export volume, causing export proceeds to be extremely volatile, especially since movements in price and quantity have tended to be rather additive.

The long-term implications of tin control have not received much attention in the current literature. And, it is not certain to what extent the substitution of other non-ferrous metals for tin, especially in the manufacture of foil and collapsible tubes, and the economization of tin in the steel industry made possible by the

FIGURE 2

TIN PRICES 1956-76

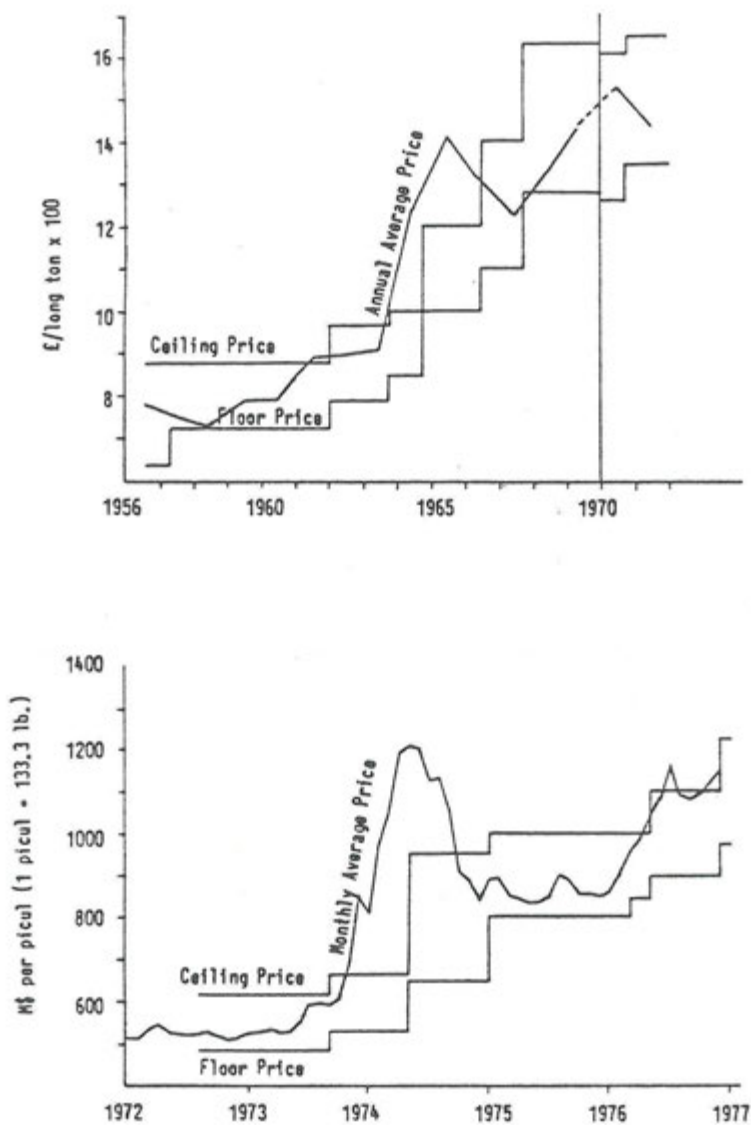


TABLE 2
SHORT-TERM PRICE MOVEMENTS IN TIN, 1924-72

Period	Character of Period	Highest Daily Price £	Lowest Daily Price £	Range %	Highest Annual Price £	Lowest Annual Price £	Range %
1924-30	Free of control	321.1	104.6	207	291.2	142.0	105
1931-39	Controlled	311.3	100.3	210	242.3	118.5	104
1950-55	Free of control	1,620.0	566.0	187	1,077.0	719.0	50
1956-60	Controlled	890.0	640.0	39	797.0	735.0	11
1961-65	Controlled	1,715.0	779.0	120	1,413.0	797.0	77
1966-72	Controlled	1,664.0	1,180.0	41	1,554.0	1,228.0	27

Source: W. Fox, Tin - The Working of a Commodity Agreement, London 1974, Table 15, p. 390.

Note: Prices in £ per long ton.

electrolytic process, could be legitimately attributed to tin control. The high prices of tin relative to the prices of other metals¹³ must have been largely responsible. It is nevertheless certain that the tin mining industry, under international control, has suffered from a lack of a sense of urgency as to the importance not only of expanding tin consumption, but also of improving tin production efficiency.

Mechanics of Tin Control

Quantitative control and buffer stock intervention represent the two important methods of tin control often used in complementary fashion so that they would reinforce each other to produce maximum effects. Thus, buffer stock purchases are often supplemented by quota reductions, while buffer stock sales are frequently accompanied by quota increases.

Quantitative control is a powerful instrument, because changes in physical supplies could significantly affect market prices, demand being notoriously inelastic in the short run. Nevertheless, there are sound theoretical objections to quantitative control.¹⁴ First, quantitative control does not provide an equally effective two-way mechanism of price control, not only because the supply response to quota releases is not as rapid as the supply response to quota cuts, but also because the control mechanism virtually ceases to function once unrestricted production is resumed. Second, quota restrictions tend to freeze the existing pattern of production and introduce an undesirable rigidity into production and trade, thus obstructing movements toward a more efficient resource allocation. Third, output restrictions tend to raise unit costs, which calls for higher prices. Finally, it gives rise to enormous economic waste by preserving high-cost obsolescent capacity and by stifling technical progress.

Quantitative control is also beset with many practical difficulties. The task of determining the size of the overall quota which would equate supply and demand at the long-run equilibrium price is formidable, not to mention the problem of estimating the long-run equilibrium price itself. There is also the problem of distribution of the quota among member countries, for historical shares in a base

period scarcely reflect differences in costs and growth potentials. The extent of quota misallocation in the past is demonstrated by the fact that the low-cost producer, Malaysia, often had to adopt the practice of producing the entire quota at the beginning of each quarter and then freezing its tin mining industry for the rest of the period, while the high-cost producer, Bolivia, was unable to meet its export quotas. Periodic negotiations or built-in formulas for the redistribution of quota would help remedy initial misallocation. The process, however, is, one of bargaining and counter bargaining which is analytically indeterminate. The point to stress here is that there is a high risk of costly errors in quota adjustments with serious implications for consumers and low-cost producers.

The main drawback of the quantitative control method is that it magnifies the usual sequence of events whereby a surplus leads to export restriction retrenchment of productive capacity and a seeming equilibrium between supply and demand which finally develops into a shortage as supply responds only with a time lag to an improvement in demand. Even though export control might reduce the amplitude of price fluctuations significantly, it tends to accentuate fluctuations in export proceeds since quota cuts invariably coincide with low prices and quota releases with high prices.

In contrast, the main advantage of the buffer stock method of control lies in the speed with which it reacts to market changes without disruptive adjustments in productive capacity. Buffer-stock operations can effectively control prices within the prescribed ceiling and floor so long as sufficient cash to buy and adequate metal to sell are held, and provided the official price range does not deviate too far from the long-run equilibrium price. Unlike quantitative control, the buffer stock method interferes only minimally with the free market forces which guide resource allocation.

Despite these merits, the buffer stock method of control is confronted with several practical difficulties, as the tin experience has clearly shown. It is extremely difficult to determine the basic price range that reflects long-term supply and demand relationships. Besides, the buffer-stock operations might generate destabilizing

speculation if doubts arise as to the buffer stock's ability to defend the ceiling or the floor of the price range. However, the most vexing aspect of the buffer stock method appears to be financing costs: the greater the degree of price stability desired, the larger the resources required to protect the ceiling and the floor.

It is fairly obvious that both producers and consumers prefer stable prices. And, it is not difficult to understand that both consumers and low-cost producers also prefer buffer stock operations to export control. The producing countries, regardless of whether they are high-cost or low-cost, must also prefer the buffer stock method to the quota method since the former tends to stabilize both prices and export proceeds whereas the latter tends to stabilize prices at the risk of fluctuations in export proceeds. This obviously calls for a larger buffer stock which requires resources of a magnitude that producing countries themselves cannot supply. This leads us to the question of contributions by the consumer countries. Why is it that consumer countries have been so reluctant to contribute to the buffer stock?

The producer-bias inherent in international tin control, to which references have already been made, partly explains the consumer attitude. But, we need to look more closely at the buffer stock operations by the Tin Council, even at the risk of some repetition.

There are reasons to believe that the consumer countries have been disenchanted with the incongruity of the tin buffer stock mechanism which has been much more powerful in defending the price floor than the price ceiling. The price floor was broken only once (for a few days in September 1958), whereas the ceilings have been broken several times with the entire price range being adjusted upward to reflect market prices.

The official price range consists of three sectors. The buffer stock manager is obliged to buy until his funds are exhausted whenever the price falls below the floor and to sell whenever the price rises above the ceiling; he may buy in the lower sector and sell in the upper sector using his own discretion, but not in the middle sector unless the Council decides otherwise. The Council had permitted buffer stock

operations in the middle sector in December 1957, March 1969 and January 1973, following the enforcement of export controls.

In practice, there has been a tendency to buy fairly soon in the higher bracket of the lower range so as to peg the price well above the floor. There has also been a tendency to behave like a pure speculator in the upper range by holding back metal and not selling it until the ceiling is broken, in a profit-maximizing manner. High-cost producers such as Bolivia have asked for buffer stock operations in the middle sector. For, the higher the bracket within which the buffer stock manager operates the higher he would tend to peg the price. Both producers and consumers have no doubt regarded the buffer stock as a price stabilizing device. But, by price stability the producers meant a guaranteed floor price which would keep shifting upward over time, whereas to the consumers it meant an assurance that prices will be maintained not too far above the floor which will not be subject to frequent adjustments in an upward direction. Herein perhaps lies the main conflict of interest between producers and consumers in so far as the buffer stock is concerned.

It would then follow from the preceding analysis that a reduction, if not a complete elimination, of the "producer-bias" together with appropriate structural changes in the buffer stock machinery would induce greater consumer participation and involvement in the international tin buffer stock. In this respect, a number of suggestions would seem to be in order. First, a certain amount of metal contribution to the buffer stock may be made compulsory in order to ensure that the buffer stock will have metal to sell. Indeed, producers may be asked to contribute only metal and consumers only cash. Alternatively, a ceiling may be imposed on cash contributions, penalizing cash contributions in excess of this ceiling in such a way that they are subject to the provision that such contributions must be at the official ceiling price, and not at the ruling market price, and never at the official floor price. Second, just as the buffer stock manager could borrow cash on commercial terms to defend the floor price, provision may also be made to borrow metal either from the producers or from other sources, such as the U.S. strategic stockpile, in order to

enable the buffer stock to effectively defend the ceiling price. Third, the buffer stock operations may be streamlined to ensure that they do not under any circumstance partake of the character of a large scale speculator motivated by profit considerations.

A more radical suggestion would be to set up two buffer stocks side by side within the international tin agreement, one financed and managed by the producers and the other by the consumers, so that the problem of conflicting interests could be to a large extent resolved. This does not of course imply a measure of confrontation between consumers and producer countries, as both buffer stocks will be subject to coordination and supervision by the Tin Council allowing at the same time a certain degree of flexibility which contributing members would like to have.

The twin buffer stock proposal might not be novel after all. It is of relevance to note that the U.S. strategic stockpile has de facto behaved like another buffer stock at times, by timing its sales in such a way as to restrain price increases when the market was strong and to support when the market was weak. This is not meant to overlook the fact that the U.S. strategic stockpile is also noted for its high-handed actions almost tantamount to economic blackmail. Also, there is no denying that the U.S. strategic stockpile disposal threats have caused highly destabilizing speculation to the detriment of the tin industry. Seen in this light, the U.S. strategic stockpile could only be described as a very crude form of a buffer stock.

The point to emphasize here, however, is that the U.S. strategic stockpile can be used to stabilize prices. But, obviously, it cannot be expected to play the buffer stock role. Nevertheless, the surplus in the U.S. strategic stockpile could be used to set up a consumer buffer stock. This would not only provide the necessary metal resources for defending the official ceiling, but also defuse the dynamite in the strategic stockpile through an orderly disposal of the surplus under the direct supervision and control of the International Tin Council.

Economic Aid and Price Support

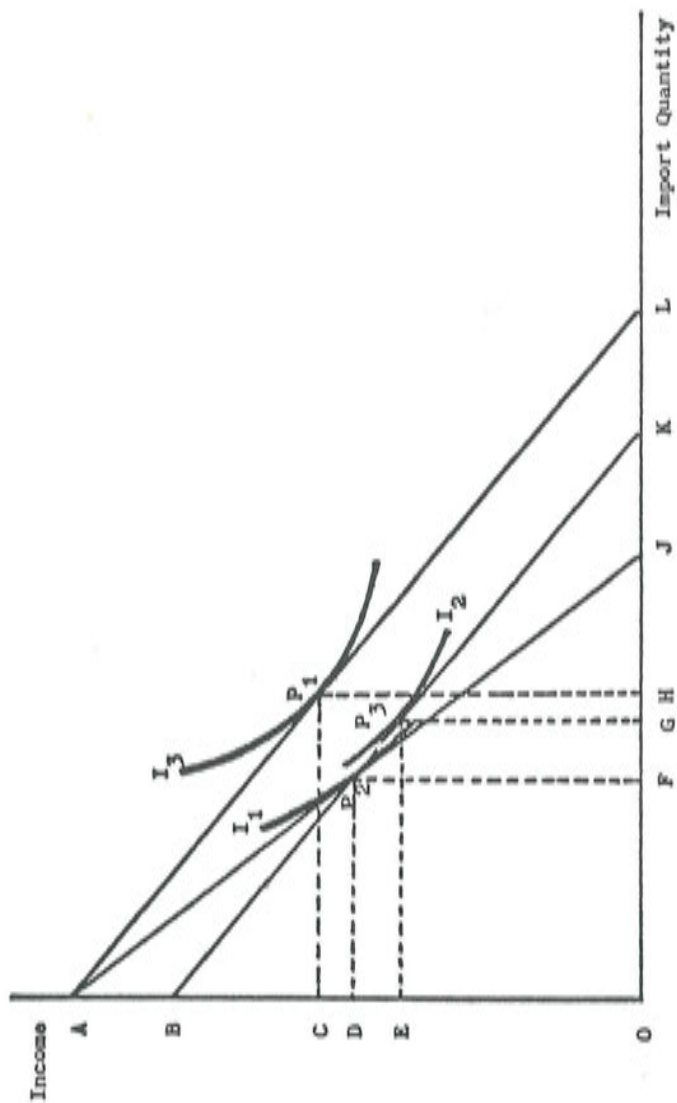
International commodity control is now caught up in the question of economic aid to underdeveloped countries. International sympathy for primary producers and international sentiment in favor of poorer developing countries are largely responsible for this. The question is: If international commodity control could secure stable prices, why not stabilize prices at a level which will give the producing countries bigger export earnings? To put it differently, commodity control is increasingly envisaged as a vehicle of transferring income from the richer consuming countries to the poorer producing countries via commodity prices stabilized above the long-run competitive equilibrium level. The issue is in fact as old as commodity control itself, for it has always subtly aimed at securing high commodity prices. The International Coffee Agreement of 1962 was the first to aim expressly at price support and others may follow suit.

Price support through commodity control appears to be an inefficient means of raising aid and transferring income from the richer consumers to the poorer producers of primary products. This may be demonstrated with the help of a simple model

In Figure 3, a hypothetical consuming country's domestic goods and import goods of a primary product are measured along the vertical and horizontal axes, respectively. AL represents the price line for the primary product under *laissez-faire*, and the point P_1 marks the tangency between AL and the community indifference curve I_3 . Given free trade, the consuming country would pay AC for OH of the primary import. Let us assume that commodity control raises the price of the primary product so that the price line shifts from AL to AJ . The new "equilibrium" point would be at P_2 on the community indifference curve I_1 ; the import volume will fall by FH and the import bill will increase by CD . In other words, the hypothetical primary exporting country's export earnings will increase by CD as a result of commodity control. The new income line BK , drawn parallel to AL passes through the point P_2 , showing that the price increase has reduced the real income by AB . The income line BK is tangent to the indifference curve I_2 at point P_3 .

Figure 3

Price Support and Income Transfer



The consumers would of course prefer to slide along the line BK until they reach the equilibrium at P, where they could stay on a higher indifference curve compared with the situation at P_2 . In other words the consumers would prefer a cash transfer of a sum of AB to the price increase.

The exporting country would also prefer the direct transfer of AB to the indirect transfer of CD, since the former is greater than the latter. It may however be pointed out that the indirect transfer CD releases more resources (equivalent to FG) from export production compared with the direct transfer. The choice would then be between DE of foreign exchange and additional resources equivalent to FG. A country with acute foreign exchange problems would prefer the former to the latter, and a low-cost producing country might also prefer DE to output restriction FG, although it would seem to make better sense for the producers to restrict output and raise prices since tin is a wasting asset. The direct transfer of AB implies that the volume of trade will be reduced only by GH, with BE accruing to the exporting country as export proceeds and AB as direct aid. The total flow of foreign exchange including the income transfer ($AE = AB + BE$) is now greater than that under the price support (AB). Clearly, AE exceeds AD by DE. From the viewpoint of welfare, the direct transfer (AB) is superior to the indirect transfer (CD), as it hurts the consumers less badly (consumers are on a higher indifference curve), channels larger funds than the price support (AB exceeds CD by DE), and avoids the undesirable effects of quantitative restrictions associated with price support. It must however be mentioned that price manipulations by commodity control could yield a second best optimum in a situation where prices are already distorted.

In spite of all this, it may be pointed out, in view of the growing resentment in both the donor and the recipient countries to financial aid, that aid in the form of high prices might be politically feasible, for it conceals financial and real costs of raising funds and avoids political and economic strings to which the recipient countries are hypersensitive. It may be that pure direct financial aid is politically difficult to effect; by the same token, international

commodity controls openly aimed at securing artificially high prices are by no means politically easy to devise, either.

There are strong objections to commodity control as an instrument of aid on grounds of equity. The incidence of indirect taxation involved in the price support is borne by the final consumer many of whom, even in the rich countries, may be very poor;¹⁵ to this extent the progressivity of the tax is ambiguous. In addition, the incidence of indirect taxation does not fall on the rich countries only, since an increasing share of the import trade in primary commodities is accounted for by the developing countries, most of who are poorer than some of the producers; to this extent price support would imply regressive transfer payments, although the regressiveness may be overcome by an intricate system of multiple exchange rates.

Commodity control is also inequitable in the distribution of funds raised through high commodity prices. Such distribution would be based upon the degree of export earnings instability for a given commodity weighted by the country shares of the world trade in that commodity. This seems hardly justifiable on either economic or ethical grounds, as it will not reflect differences in per capita income or absorptive capacity among the recipients.

There is also the danger of transfer payments leakage. Since a significant share of primary production in the underdeveloped world is under foreign ownership and control, a substantial proportion of economic aid via price support may leak out of the recipient countries in the form of larger profit remittances. In theory, such leakages can be prevented by efficient export and income taxation. In practice, however, any increase in the tax rate is likely to be extremely tardy and the governments are likely to encounter strong resistance from pressure groups against tax increases.

A conclusion of considerable importance to be drawn from the present analysis is that international commodity control is not the best means of transferring resources from the rich consuming countries to the poor producing countries via excessively high commodity prices. It appears that it would make better sense if international commodity control pursues its traditional objective of stabilizing prices by

eliminating short-term fluctuations than if it were to attempt price support by seeking prices significantly above the long-run free market equilibrium level.

FOOTNOTES

¹World production increased from 125,000 tons to 193,000 tons between 1922 and 1929, nearly half the increase being accounted for by Malaysia.

²Thailand joined the scheme in July 1931

³Belgian Congo, for example, was allocated 4,500 tons in 1934 while its standard tonnage in 1929 was just over 1,000 tons.

⁴Each member country was given five initial votes in addition to the votes allocated on the basis of consumption and production. Much of the decision-making, such as regulation of exports required only a simple majority of both producers and consumers, whereas for the election of the Chairman, for instance, a two thirds majority of both sides was required

⁵Export restriction might also be imposed if the Council decided by a weighted majority vote that 10,000 tons of tin was likely to be held before the end of the current control period.

⁶Quota percentage allocation as of July 1956 included: Malaysia, 39.07; Indonesia 22.94; Bolivia, 22.94; Belgian Congo and Ruanda-Urundi, 9.31; and Nigeria, 5.75. See ITSG 1956 Statistical Yearbook.

⁷The Russian tin exports jumped from 500 tons in 1956 to about 9,000 tons in 1957 and to about 18,000 tons in 1958.

⁸Import quotas were imposed by Britain, Holland and Denmark on Russian tin and were removed only in 1959 after the USSR had given assurance to limit its tin exports below the 1957 level.

⁹The United States strategic stockpile stood at 349,000 tons, of which 164,000 tons were declared surplus.

¹⁰The States of Malaysia Chamber of Mines the President's Address at the 66th Annual General Meeting, Kuala Lumpur, 26 May 1977.

¹¹Rowe, J.W.F., Primary Commodities in International Trade, Oxford 1965, p. 186

¹²Mohamed Ariff, Export Trade and the West Malaysian Economy, University of Malaysia, Kuala Lumpur, 1972, pp. 144-45.

¹³Tin often sells at prices 3-4 times the prices of copper, six times the price of aluminum and 10-12 times the price of zinc and lead.

¹⁴Mason, E.S., Controlling World Trade: Cartels and Commodity Agreements, New York, 1946, pp. 225-27; United Nations, Commodity Trade and Economic Development, 1953, paragraphs 2-7; Rowe, J.W.F., op. cit., pp. 184-98.

¹⁵MacBean, A.I., Export Instability and Economic Development, London, 1966, p. 302.

INTERNATIONAL COMMODITY CONTROL -- THE TIN EXPERIENCE
A COMMENT

Laurence L.C. Chau

Tin is a classical example of a mineral commodity surrounded with problems of fluctuating prices, unstable demand, income disparity between producing and consuming nations, and differential impacts of instability to producers and consumers. And it also provides an excellent case study of the working of an international regulation scheme. In 1972, 87 percent of tin exports came from developing countries and 88 percent of such exports went to developed countries. When the market was free, the price of tin fluctuated widely; in 1920, the price per ton ranged from £195 to £419, and between 1947 and 1953, the price went up from £382 to £1620. And volume of trade tends to move with prices, amplifying the fluctuation of export earnings. The situation is highly disruptive for the few countries which depend heavily on tin for their export earnings. Consequently, it also has the most long-standing tradition of well-organized commodity agreements, dating back to the early 1920's.

Mohamed Ariff has written a lucid and well-balanced paper on the performance and problems of the tin control schemes. In Section 1 he distilled the essential elements of the eight international tin agreements that dated back to 1931, thus setting the stage of his discussion of Section 2, in which he evaluates the performance of these schemes. This is followed in Section 3 by recommendations to improve the working of the scheme. The paper concludes with an evaluation of the effectiveness of commodity schemes as means for international income transfers. Throughout, there is a well-proportioned presentation of facts, statistics, analysis and opinions making the paper both informative

and stimulative. Particularly, Ariff's judgment is not tainted by the fact that he comes from the major tin producing country.

To start, we can evaluate the effectiveness of tin control schemes in terms of their stated objectives. The first is to balance production and consumption. The author refers to this as the removal of burdensome surplus. This would imply that, in the absence of control there will be a tendency toward excess supply, a thesis he has not elaborated. In this aspect, they were successful. In the broader context of balancing production and consumption, the postwar schemes were less than successful in a number of years. But the disequilibria were results of extraordinary circumstances leading to violent shifts of demand or supply.

Turning to the most important professed objective of the tin agreements, price stabilization, performance has been mixed. Generally, the Tin Council was more effective in stemming downward movements of prices, as in 1956-61. It was completely ineffective during the 1961-66 shortage, for the simple reason that it had no buffer stock to do the work. For 1966-71, on the other hand, balance of consumption and supply was achieved with relatively minor intervention from the Council. In short, in spite of its long history, the international tin agreement has not had an extended period of normalcy, in which both the demand and the supply conditions were free from political disturbance, to test the potency of such exercises in stabilizing price.

Closely related to price stability is stabilization of export earnings. In more than one place, Ariff pointed out that tin controls have destabilized export proceeds. This conclusion is difficult to understand. If the demand for tin is, as the author puts it, "notoriously inelastic in the short run," price stabilization should also stabilize revenue. For example, as total revenue can be increased by charging a higher price, the total earning of all exporters as a whole can be raised by restrictive measures at the time of depressed demand.¹ This should help to stabilize the export revenues of Malaysia, unless the author can argue that output and export were restricted in a way particularly detrimental to the interest of

Malaysia.

The author pointed out that the primary objective of tin control was to raise prices through output restrictions. Though he did not say how successfully this objective was achieved by post-war agreements, repeated references have been made to "producer bias" in his description of the control mechanism.

As a matter of record, for over 70 years the price of tin has risen more than prices of other non-ferrous metals. Some evidence is presented in the paper by Magee and Robins in these Proceedings.

Two sources of production inefficiency have been pointed out. Sheltered markets and high prices have reduced incentives to increase production efficiency and to reduce cost. Secondly, under quantitative control the assignment of quota perpetuates high cost producers, raising the total cost of production. The first point is perhaps unfair. R & D are not the responsibility of an international marketing association. As to incentives, since cost reduction benefits directly the producer, there is no theoretical reason why more stable or higher prices should reduce the incentive for improving production efficiency.

With regard to the second source of inefficiency, it is true that under any practical quantitative restriction and allocation of output, marginal costs of producing countries are likely to be different, so that total cost of production is not minimized. But such inefficiency can be circumvented by making the export quota marketable among nations, or, as suggested in Pinera's paper, by separating the world price from the revenues received by producers in different countries. Secondly and more important, it is unlikely that, in the absence of commodity agreement, production is distributed in a way such that marginal cost is equalized among all producers. As an oligopolistic industry, prices may well be pegged at a level above marginal cost.

This leads to the problem of determining the long-run equilibrium price. The author writes as if there is an objective long-run equilibrium price, though difficult to determine. I am inclined to think that such a long-run price is not only impractical for policy guidance in the sense that our knowledge of it cannot keep up with its

propensity to change, but that it is subjective. As an exhaustible resource, the price of a mineral should include a resource or user's cost in addition to the marginal cost of production. The optimal size of such a user's cost, which determines the rate of exploitation, depends on future demand and supply and the discount rate of future income. The former is obviously subjective; the latter is not only subjective, but it also differs from nation to nation and from time to time.

If a long-run equilibrium price cannot be determined objectively, then the question of how to relate to it becomes an empty question. The ground for economic moralization becomes very uncertain. Pricing becomes largely a distributive problem, a problem of charging what the market can bear, a balancing of benefit and cost, in which political and other considerations have a role to play. Once more, economics becomes political economy.

INTERNATIONAL COMMODITY CONTROL -- THE TIN EXPERIENCE
A COMMENT

Kenji Takeuchi

Recently there has been a resurgence of interest in international commodity agreements as a vehicle for improving the relations between developing and developed countries. In this context, it is quite appropriate for us to review the experience of international control of the tin market, because tin is one of the few commodities with a long history of international efforts to control the world market.

I would like to congratulate Mohamed Ariff for his excellent review of international tin agreements. In my view, Ariff has five important conclusions regarding the operations of various international tin control schemes instituted since 1921:

- (1) Throughout the history of international tin control, there has always been strong producer-bias.
- (2) International Tin Agreements have been successful in reducing potential burdensome surpluses.
- (3) International Tin Agreements have also been successful in reducing price fluctuations.
- (4) International Tin Agreements have not been successful in stabilizing export earnings, output or employment.
- (5) International commodity agreements are not the most efficient means of economic resource transfers from developed to developing countries.

While I accept some of his general conclusions, I feel that Ariff is somewhat unfair in some respects, and I would like to focus my discussions on these aspects.

First, Ariff argues that there has always been a strong producer-bias throughout the history of international tin agreements. While this may be true, I feel that his evaluation of this point is too one-

sided. International tin schemes in the pre-war period were admittedly producer-dominated schemes. However, it is important to recall that the main objective at that time was to alleviate the problem of burdensome surplus. Therefore, with such a producer-biased objective, the pre-war schemes had to be producer-biased. I would like to point out, however, that since consumers were interested in maintaining the good health of the world tin industry, even the producer-dominated schemes served the long-term interest of consumers, in so far as these schemes were successful in salvaging the world tin industry. Furthermore, in those days, the tin industry in Malaysia and Indonesia was under the colonial control of the British and the Dutch.

Ariff argues that the influence of consuming countries in the post-war schemes and agreements has been minimal. I hope that he is not accusing producing countries, because I feel that the lack of consumer influence has been entirely due to the fault of consuming countries. Some major consuming countries simply stayed out of these agreements until recently by their own choice. The largest consumer, the United States, became a member only in 1976. For twenty years (or in four successive agreements) the U.S. stubbornly stayed out of the tin agreements. Also consuming countries did not make financial contributions for the buffer stock until recently. If there had been fully matching contributions from consumers, the consumer members would have had greater influence in steering the operations of the agreements.

Second, Ariff contends that the Tin Agreements have been over-successful in avoiding potential burdensome surplus, implying that the tin producers have restricted supply excessively in collusive, quasi-cartel fashion. Recently, in the context of the review of the price range for the international tin buffer stock, some representatives of consuming countries complained that major producing countries have not been expanding their tin production fast enough despite the fact that the price has been quite high. In my judgment, however, supply in Malaysia, Thailand, and Bolivia have not been expanding mainly because of internal political problems that have nothing to do with the international tin agreement. In other words, the supply in these countries would not be expanding any faster even if there were no tin

agreement. If anything, I would tend to argue that the supply has been lagging partly because the price has not been high enough to provide adequate incentives for output expansion.

Third, Ariff concludes that, while the tin agreement have been generally successful in reducing overall price fluctuations, they have not been so successful in defending the ceiling prices as in defending the floor prices. I agree with that observation. However, I would like to argue that, if larger financial resources had been available by way of consumer contributions, the Tin Council would have been more successful in defending the ceiling prices.

Fourth, Ariff concludes that, in the case of Malaysia, the operation of the tin agreements have destabilized the export earnings from tin. I have not had a chance to examine the evidence he has on this subject, but, on a priori grounds, the opposite should be the case. If market stability in the world tin market is stemming more from demand shifts rather than from supply shifts, and if the supply elasticity is less than unity, the operation of a buffer stock and export quotas should reduce the instability in export revenues.

On the whole, considering the handicaps that have fettered the successive tin agreements, I believe the post-war agreements have worked fairly well. What we should do is to try to improve the existing framework rather than to try to dismantle it. Fortunately, the consuming countries have finally decided to make financial contributions for the tin buffer stock under the current fifth agreement, having realized that the enlargement of the financial resources for the buffer stock would enable the ITC better to defend the ceiling price and that it would really benefit the consumers. Thus, under the provision of voluntary contributions, Belgium, Canada, Denmark, France, the Netherlands, Japan, United Kingdom and the United States have promised to contribute toward the buffer stock. The Federal Republic of Germany has not yet come around to joining the above countries. We hope that other consuming countries will soon decide to make their voluntary contributions.

At the same time, I would like to express my hope that the Bolivian government restrains its rather short-sighted attitudes. After all, those of us who believe that international commodity

agreements can be useful if conceived and operated sensibly would like to be able to cite the experience of tin as a successful example. In the same vein, we hope that Malaysia will promptly review its tin taxation policy in order to make sure that the Malaysian tin industry is given enough incentive to expand production promptly in response to rising demand.

INTERNATIONAL COMMODITY CONTROL -- THE TIN EXPERIENCE

A COMMENT

Sirman Widiatmo

First, my compliments to Mohamed Ariff for his thorough analysis of the tin agreements. The historical sketch may be brief, but there is no omission, every nuance is meticulously reflected.

However, as one of the negotiators and indeed one of the operators of the last three agreements, in addition to being a market operator for the last 20 years, I wish to make several comments. I may help by updating Ariff's assessment with the latest developments.

I must submit that I do not subscribe to the statements of Ariff as follows: "There has been an unmistakable shift in emphasis from price stabilization as a benefit to the producers and consumers of the commodity to price stabilization as a benefit to the producing countries' national economies...Commodity control is also increasingly looked upon as a powerful instrument of effective aid from the richer consuming countries to the poorer primary producing countries through commodity prices stabilized at the highest possible level."

On the contrary, the post war tin agreements have evolved into a more and more genuine and equal partnership between producers and consumers. Successive post-war agreements contained new concepts, introduced by members in their endeavor to achieve the objectives of the agreement. Ariff seemed to concentrate on two instruments of the Agreement, that is buffer stock and export control. There are three instruments to attain the objectives:

- a) Appropriate price ranges, which should correct structural maladjustments in the production of tin. This instrument is geared towards long-term supply and demand equilibrium. By definition, the price range should be revised either upwards or downwards. As a corrective measure, one ought to fix the price range generously in time of shortage in order to induce investment, and in

time of surplus the inducement ought to be dismantled. The idea of a higher range to attract investment and a lower range to contract production is to me a more natural way to correct the maladjustment between supply and demand rather than export control.

b) Buffer stock scheme

This mechanism is not geared towards solving the problems of surplus or shortage. Its function is to reduce excessive price fluctuations. It is only meant to cushion the effects of violent price oscillations by straddling the long-term price trend. However, a large enough buffer stock would obviously help overcome longer-term supply-demand problems.

c) Export control

This instrument is only to complement the buffer stock scheme. Ariff indicated that the buffer stock manager (BSM) must have accumulated at least 10,000 tons before export control can be restored. In addition to this, the BSM must be convinced that he will not have sufficient cash to absorb an apparent surplus. The imposition of the above two pre-conditions are not a clever attempt to elevate the role of export controls above that of the buffer stock. Export control, which inevitably will lead to production control, is harmful to both consumers and producers. Therefore, export control is by design only a tool of last resort.

Export control need not be imposed. For example, the last two export controls would not have been necessary if the buffer stock were large enough. With a buffer stock of 40,000 tons, the BSM would have the capacity to syphon off the production surplus, thus avoiding retrenchment of production capacity and subsequent supply shortage. You may recall that the last two export controls were imposed when buffer stock holdings were 11,000 tons and 19,000 tons respectively.

I am, of course, very appreciative for the suggestion to improve the functioning of the agreement. On the first suggestion, I would

like to ask whether it is the intention to have both cash and metal contribution be paid in at the entry into force of the Agreement and lock up the huge funds for future operation of the buffer stock. It would be very costly. Or is it the intention that producers should be ready with metal when tin is short and consumers with cash in time of oversupply? Well, to contribute cash is no problem, but to contribute metal would aggravate the shortage.

The second suggestion is to borrow metal to defend the ceiling. If it were to be from the producers, it would hardly be possible. They would need the metal themselves.

On the twin buffer stock. I would think that it will not be workable, because it again is dependent upon the statistical position of supply and demand at the entry into force of the Agreement. Only the USA has tin stockpiled and one would have to assume that the US government is willing to subsidize DC members and the willingness of the DC members to accept such a subsidy. If I am to make a suggestion, it would be to enlarge the buffer stock and to adopt a more rational and systematic approach to the price range.

With respect to economic aid I would like to reiterate, that the tin agreement, unlike some other commodity agreements, is a forum of partnership with mutual benefit and equal rights and obligations. We do not look at the International Tin Agreement as a device to transfer resources from DCs to LDCs. I wish to emphasize that the tin agreement is pursuing its objective of stabilizing prices by eliminating short-term price fluctuations.

INTERNATIONAL COMMODITY CONTROL -- THE TIN EXPERIENCE
GENERAL DISCUSSION

Stabilization of price and redistributing income to tin producers by maintaining the price above a free-market level were the two most discussed topics.

Two papers by participants from resource-rich developing countries (those by Ariff and Pinera) view commodity agreements as not the way to achieve income redistribution. While the need for redistribution is generally agreed, acceptable ways to achieve it have been difficult to devise.

Both donors and recipients are concerned with the way and amount of aid given, and the use of commodity prices as a vehicle was raised in this context. This may not be economically the best solution, especially as it will involve resource-poor developing countries subsidizing resource-rich ones. Any solution will have to be politically acceptable, and if economists do not consider non-optimal, but politically feasible, approaches, they are abdicating to political scientists.

Tin is something of a special case as a mineral since it is generally produced by small, indigenous firms, with little foreign involvement in mining. Ariff noted that since in Malaysia the mines each have had a share of the country's quota, and they can fill it without working continuously through the year, there have been some real inefficiencies. An open market for quota shares somewhat mitigates this.

A producer bias in the tin agreement was generally recognized, although in the 1930s maintaining of the industry was no doubt beneficial to consumers as well. The question of who specifically has benefitted from the presumed higher prices was raised. Any benefits to the producers seem to have been dissipated in inefficiencies.

One manifestation of the bias is that the ceiling price is not

defined vigorously while the floor is. However, most of the breaches have been the result of exogenous factors including the Vietnam War and post-oil-embargo commodity speculation. The hope was expressed that such noise in the system was not being factored into long-term output plans.

Internal political problems have had an impact on output: one example is the land tenure issue in Malaysia hindering new development. These really need to be resolved before overall stabilization can be achieved.

The ITC has not been good at predicting demand, and otherwise implementing goals. There is not even an economist on the staff.

Stabilization has not been achieved by the ITC -- indeed tin was more unstable than other nonferrous metals. Quite simply the ITC quickly has run out of tin or money, so it has paid to speculate against the agreement.

Stockpiles are of two types: strategic (for protection against emergencies), and specifically to try to stabilize prices. Ariff's proposals for stockpiling were questioned -- particularly as regards to buying tin in a rising market, as it is obviously counterproductive if the goal is to restrain prices. Whether the U.S. government would contribute from its strategic reserve is also problematic. Whether the U.S. Congress will agree with the Carter Administration proposals on releasing stocks is an open question.

The impact China and the Soviet Union might have on the market was raised. Ariff noted the Soviets had in the past cooperated when pressured, as in 1957. China was not expected to be a large factor in supply.

The present high price of tin is leading to reworking tailings from old mines rather than to new openings. This reflects producer doubt on prices continuing to be high enough to justify new investment, and also on political and environmental issues.

In his reply to comments, Ariff stressed his feeling that export earnings had been destabilized by the ITC because of the use of quotas, which cause quantity to fall when prices decline. Also, inefficiency has resulted from the price floor, since there is little incentive to control costs closely.

AN ORGANIZATION FOR PACIFIC TRADE, AID AND DEVELOPMENT:
REGIONAL ARRANGEMENTS AND THE RESOURCE TRADE*

Peter Drysdale

In the past decade or so the rate of economic growth in the countries around the Pacific Ocean, their rapidly expanding trade, investment, and commercial relations, the need to put the great power relations in the area on a new footing, and the emergence of the European Economic Community have generated speculation about the possibility of establishing some form of regional economic association among the nations of the "Pacific Community."¹ The ideas that have been canvassed had their initial interest partly because of the expansion of the European Community and were partly built on the foundation of growing regional economic interdependence induced by rapid heavy industrialization in Japan. At the centre was a vast new trade in raw materials, reciprocal trade in manufactured goods and facilitating investment flows. The threat to world market access which the European Community posed in the first half of the last decade was supplanted in the first half of this decade by the risk of economic conflict between suppliers of raw materials and consumers of raw materials and the risk of conflict among major industrial trading nations over competition intensified by a period of unusually prolonged and general recession in the focus of interest in Pacific approaches to foreign economic policy. Of underlying significance to all these changes, however, "is the

*I am grateful to James Horne for research assistance and contribution to the argument of this paper. The paper also owes much to Ross Garnaut, on development assistance policies, and Charlotte Williams, on the politics of Pacific economic co-operation. The interpretations are, of course, my own.

evident need to find a fitting place within the international power structure for an increasingly important Japan."²

The aim of this paper is simply to review the nature and origins of the proposal for regional association in the form of an Organization for Pacific Trade, Aid and Development and, with that perspective, to ask what positive role, if any, such an organization might play in securing the interests of both consumers and suppliers in the resource goods trade. It concludes that, alongside the earlier the arguments, the characteristics of the resource trade problem add special weight to the case for this form of regional association. The first section of the paper establishes the 'importance of economic interdependence in the Asian Pacific region. The next section reviews the various proposals that have been put forward for strengthening economic integration in the Pacific and the origins of the proposal for establishing an Organization for Pacific Trade, Aid and Development. The paper goes on to explore the importance of the resource trade in the Pacific region and the intensification of concern about resource security as a major regional as well as international economic policy issue. The key role played by developing country resource suppliers within the region and the external funding of resource developments leads to a discussion of the effectiveness of development assistance and private investment flows in their financing and efficient location. The complex problem of energy security is also examined as a case specially representative of the interest of Pacific countries in policy co-ordination within a regional framework. Finally, an agenda for action towards policy initiatives within the framework of a regional organization is laid out. It gives stress to the issues of resource and energy security within the region but notes that these issues must be dealt with in a context of wider trading, investment, and development interests that will recommend action on a number of fronts at the same time.

The term "Pacific Community" is used variously to refer to at least two major groups of countries: one, the five Pacific advanced industrial countries comprising the United States, Japan, Australia, New Zealand and Canada; the other, a wider group including these five countries as well as the developing countries of East Asia, Southeast Asia, and the rest of the Western Pacific. It sometimes includes the

countries of Latin America, China, and the U.S.S.R. The first group is conveniently called the Pacific Five and the second the Pacific Basin nations.³ Here, among the latter countries, the focus of discussion is on Western Pacific Countries, and China, the Soviet Union and Latin America are introduced separately.

1. Perspectives

The idea of a community associated in some form of Pacific regional organization began to emerge in the mid-sixties, principally in business and academic circles, but later tentatively from official quarters; and there are good reasons for it. The principal reason for interest in the area as such and the most evident regional link is the spectacular increase in economic power in the region, and, more strikingly, the growth in trade among Pacific countries themselves.

Within the Asian Pacific community, Australia and Japan were developing a bilateral economic relationship of considerable international significance. The post-war Australia-Japan relationship grew out of commercial policy initiatives in the middle fifties. In their subsequent reactions to the changing international environment both countries moved towards closer involvement with each other. No better illustration is there of this than in their response to the emergence of the European Economic Community and the problems of global market access in the middle sixties.

Australia's response to the damaging effects of the European Common Agricultural Policy on the prospects for Australian economic growth based on the expansion of traditional markets for agricultural exports was to intensify the development of new markets in Japan, the Pacific, and Asia.⁴ Japan's response to the emergence of a discriminatory bloc within Western Europe was to encourage closer economic relations with its major Pacific trading partners and pursue a commercial diplomacy designed to counter the effects of intensification of European protectionism by developing an alignment of interests within the Pacific economic community.⁵ These policy responses were in part a product of the established trading intensity between Australia and Japan and their Pacific neighbors. But they were

also destined to bring the two countries even closer together, as new trades were developed in the minerals area, the like of which the world had never known before.⁶

Australia's burgeoning trade with Japan, Asia and the Pacific was nonetheless only one element in an extensive, if not fully integrated, matrix of commercial relations among Asian Pacific countries -- Australia with Japan, the United States, and the South Western Pacific; the United States with Japan; New Zealand with Australia and the United States; and, at the center, Japan with virtually the whole region.⁷ The development of the Asian Pacific economic community has, of course, to be seen in the context of a period of unprecedented growth in international exchange, a process to which Japan, through her rapid rise to great economic power status, contributed significantly. But in this era of expansion, economic interchange in the Pacific grew deeper and wider as rapidly as it did almost anywhere else in the world.

The vigorous growth of trade among Asian Pacific countries has occurred without the framework of special institutional arrangements such as those which encouraged the growth of transactions within the European Economic Community, or even across the Atlantic, among the original OECD countries. Trade among the Pacific Five grew steadily from slightly over 10 percent to slightly over 13 percent of total world trade between 1960 and 1970. In 1974 and 1975 this share stabilized and began to fall. In 1974 it was slightly below 12 percent. This reflects the impact of the rise in the price of oil on relative trade shares, an effect that has already begun to reverse, especially in the wider Pacific Basin region. From 1965 to 1970 trade within the Asian Pacific region, including Latin America, grew at a rate of 14.8 percent.⁸ This growth rose to 25.4 percent per annum from 1970 to 1974 and has generally been faster than world trade growth.

During this period United States trade with the region grew at a faster rate than with the EEC. United States exports to the Asian Pacific region grew at a rate of 18.1 percent during 1970 to 1975, and imports by 15.3 percent. The comparable figures relating to the EEC were 15 percent and 12.1 percent respectively. United States trade with Pacific Basin countries reached a peak relative share between 1970 and 1975, as did the general share of intra-regional trade. The share

of United States exports going to the Pacific Basin, excluding Latin America, fell from 42 percent in 1970 and 39 percent in 1975. Imports followed the same trend, falling from 52 percent to 48 percent over the same period. The figures for the latter year reflect the impact of the oil price regime established by OPEC.

A variety of other economic factors link the Pacific Basin countries. One is foreign investment. Japan is now the largest foreign investor in the Western Pacific. In 1975, Japan had supplied 33.6 percent of accumulated investment in the region of approximately \$US 10 billion. The rate of growth of Japanese investment was also very rapid. Japanese investors have directed their efforts to two areas. They have extended, and are continuing to extend, their involvement in the manufacturing of electrical machinery, textiles and sundry goods. Since 1973 there has been a shift towards intermediate goods lines such as petrochemicals (South Korea, Taiwan and Hong Kong), metal processing, and transportation machinery (especially in Singapore). Also Japanese investment has been strong in resource-oriented developments - such as forestry and mining, and associated resource processing industries (for example, aluminum refining in Indonesia). Japanese industry is rapidly going multinational. If Latin America is included, the Pacific Basin presently accounts for 65 percent of total Japanese investment abroad. Joint investment projects are a part of this growth. The Bluff Aluminum Smelter in New Zealand, using Japanese, American and European capital, New Zealand hydroelectric power and Australian bauxite,⁹ the proposed Pilbara complex in Western Australia using Australian, American, European and Japanese capital, and the possibilities of joint American-Japanese involvement in the development of Siberian resources are all examples of this.

American investment, though small relative to United States investment elsewhere, is of great importance to the region. Until recently, the United States was the premier foreign investor.¹⁰ While this position is now occupied by Japan, American investment in the region is considerable, accounting for approximately one quarter of the accumulated investment to the end of 1975. In South Korea and Taiwan, American direct investment is strong in light manufacturing

industries, particularly in the form of "international sourcing" for multinational companies. A notable example of American investment is the establishment by the American automobile industry of regional chains of manufacturing and assembly plants around the Pacific in order to compete against the Japanese car manufacturers for the growing market there.

The distances of the Pacific Ocean have been largely overcome by technological advances in satellite communication and in air and marine transport. The use of jumbo jets, and innovations such as containerized shipping and bulk freighters are of crucial importance to an area which for the greater part of its commerce and travel must cross vast areas of sea. Trans-Pacific tourism and air traffic, although considerably smaller than that across the Atlantic, has grown more rapidly and according to 1973 forecasts was expected to exceed quite substantially world rates of growth in travel and tourism.

Growth in trade, investment and transport has led to a corresponding increase in multinational banking activity in the Pacific Basin. According to one report, American banks in Asia (except Japan) as of June 1974 had more than \$6 billion out on loan. The region is one of the fastest growing areas for multinational banking and one that might become the "economic and political action field of the world that the Atlantic was in the 1950's and 1960's." While this optimistic prediction might now be modified in the light of the increase of oil prices in late 1973 and early 1974, it and the figures quoted earlier are striking evidence of the rapid economic growth and regional interaction of the Pacific Basin and the expansion of involvement and interest of American business and industry there.

Relations between the Pacific developed and developing countries are also close, not only through economic links such as investment and trade (where regional, especially Japanese, dependence on the developing countries is extensive) but also through the flows of development assistance. The United States, although more deeply engaged in aid programs in South Asia, has nevertheless given large quantities of assistance to South Korea, Taiwan and Thailand as well as the Philippines and Indonesia, principally in support of diminishing but still significant security commitments. Developments in American relations

with Vietnam, Laos and Cambodia, during the reconstruction stage in those states, and the response of the ASEAN group of countries to the new security situation in Southeast Asia will be crucial determinants of regional stability and prosperity.¹¹ Japanese aid, which mirrors closely that country's economic interests, is heavily concentrated in the Asian Pacific area. Both the Japanese government and the private sector have been also very active in sponsoring regional conferences and organizations in fields such as agriculture, fisheries, productivity and economic development generally. The United States and Japan are the moving forces behind the Asian Development Bank. Australia and New Zealand have focussed their aid efforts in Southeast Asia and the South Pacific, with a large Australian aid program to Papua New Guinea, a former trust territory.¹² Canadian aid to Asia and the Pacific has so far been limited, since its aid program is substantially directed towards the "most seriously affected" states (primarily in Africa and the Caribbean).

In the background, aside from the positive and specific unifying factors already mentioned, there is a much more general but nevertheless common feeling of frustration with the trade policies of the EEC. All the Pacific Five have an interest in an open international trade and financial system and all have suffered in varying degrees from European trade restrictions. There is some annoyance also at the tendency of the EEC to expand through widening membership and "association" with neighboring developing countries in return for reciprocal favorable treatment and trade preferences.

2. Proposal for a Regional Organization

It is not surprising that the idea of a formal Pacific association was first articulated by the business, political, and intellectual leadership in Japan. No nation is more central to the substantial number of interests that have come to be shared by the countries of the Pacific Basin than is Japan. In the mid-sixties, the concept of a burgeoning Asian Pacific community of nations became a commonplace in the rhetoric of Japanese men of stature as they talked of world affairs.¹³ The idea of a formal Pacific association was first espoused by the Japanese at an official level when in 1967 the then Foreign

Minister, Takeo Miki, outlined his ideas for an "Asian Pacific policy" based on an "awareness of common principles," regional cooperation in Asia, cooperation among the advanced nations in the Pacific area and more extensive aid programs.¹⁴ Although there were no major policy initiatives while Miki was Foreign Minister, the Pacific Trade and Development Conference series was launched, with Foreign Ministry support, to consider Kojima's Pacific Free Trade Area proposal,¹⁵ and it has continued to involve a wider and wider group of policy-interested economists in the discussion of regional foreign economic policy issues over the ensuing decade.¹⁶

While bilateral ties have continued to strengthen,¹⁷ nothing in the broad area of a Pacific Economic Organization has gained sufficient political support to translate into policy action, although there has been definite official interest shown in the proposals.¹⁸ In addition, there have been non-official proposals. The most concrete step to date toward a regional economic organization has been undertaken by those with more immediate and practical interests. In 1967, businessmen, bankers and industrialists from the Pacific Five formed the Pacific Basin Economic Council (PBEC), a body designed to promote the study and discussion of issues raised in regional trade and investment and greater cooperation between public and private interests. It now has a membership of more than 400 major companies from the Pacific Five nations and from many developing countries of the Pacific Basin area. The American membership of this organization was initially drawn heavily from the Western States but now includes increasing numbers of larger Eastern and Mid-Western business and banks. The Private Investment Corporation for Asia (PICA), established to promote investment in Asia, arose out of PBEC meetings. Its capital and lendings are, however, quite small. At its Seventh General Meeting in Washington in 1974, PBEC proposed to adopt a revised covenant which allowed for the establishment of a Central Secretariat which now operates from the Stanford Research Institute.

There has been considerable academic discussion of the concept of Pacific economic cooperation, principally emanating from this Conference series. It began with the proposal originally developed by Kojima

for a Pacific Free Trade Area.¹⁹ This proposal was developed in some detail and involved the removal of trade barriers among the Pacific five as well as the extension of non-reciprocated tariff concessions to Asian Pacific developing countries. A preliminary was to be the adoption of three codes of behavior on trade and investment matters by participating countries.

The Pacific Free Trade Area idea has proved both politically and economically unacceptable. Inside Japan, there were those who drew parallels between the Asian Pacific area proposals and the discredited Greater East Asia Co-prosperity Sphere of the inter-war and wartime period. In fact, of course, there were no such simple parallels. It is true that in Japanese attitudes towards relations with Asian and Pacific countries there is historically a discernible ambivalence between the nationalist-expansionist position and the internationalist position, Pan-Asianism incorporating large doses of the former as well as the latter.²⁰ But the Pacific Free Trade Area idea was motivated by an interest in straightening out increasingly important problems among the industrial country equals of the Pacific region and in correcting a growing disparity in the development of their economic relations with neighboring countries.²¹ The PAFTA proposals derived principally from a concern to maintain and extend Japan's links with the rest of the world, not to confine and restrict her economic partnerships to the region.

These reactions in Japan had their counterpart outside Japan, in the response or lack of it in other countries, especially the smaller countries such as Australia, Canada, and New Zealand.²² There were fears of Japanese domination. The economic gains (wrongly conceived by Japanese proponents and foreign critics alike to be measured in country by country balance of trade movements) were seen as heavily weighted in Japan's favor. And all this Japanese gain was to be achieved at substantial adjustment cost for the smaller partners, or so it was argued.²³

I was one, outside Japan, who thought that the focus of foreign economic policy interest which underlay the PAFTA proposal was a valid focus, and, even if over ambitious and of limited immediate policy

relevance, that it contained the seeds of a useful approach to important problems which were emerging in the growing economic and other relations among the diverse economies and societies of the Asian Pacific region.²⁴ The huge growth of trade, investment, and aid relations among the countries of the Asian Pacific region was spawning quite predictable policy problems and these problems were being managed less and less well within established bilateral arrangements or by individual countries unilaterally. In this context, the PAFTA proposal provided a useful framework for the evaluation of other ideas.

The advocacy of an Organization for Pacific Trade, Aid and Development (OPTAD) grew out of the debate about the PAFTA idea.²⁵ Whilst a free trade area was not likely to get off the ground successfully, there remained ample scope for institutional innovation and policy initiatives directed towards the broad objectives of extending and securing Asian Pacific economic co-operation.

The OPTAD idea was first raised at the 1968 Pacific Trade and Development Conference by Kiyoshi Kojima and myself. Kojima accepted the OPTAD idea as a vehicle for giving effect to his Pacific codes of international behavior: a code of good conduct in the field of trade policy; a code of overseas investment; and a code of aid and trade policies towards associated developing countries in Asia and Latin America. Kojima "originally thought that OPTAD would be an intermediate step and would constitute a steering body to realize a Pacific Free Trade Area. (Now he looks)...to changes in the present multi-lateral approaches and negotiations through OPTAD, so as to give much closer attention and priority to the promotion of functional economic integration and development in the Pacific, Asian, and Latin American region."²⁶ I stressed the potential of OPTAD, even if there were no comprehensive movement towards regional trade liberalization on a preferred or most favored nation basis, for encouraging trade expansion and investment flows which would serve the development objective. OPTAD was importantly assigned the role of "...promoting and directing capital movement into less industrialized partners."²⁷ The OPTAD proposal was elaborated at the Second Pacific Trade and Development Conference and has been discussed quite widely, particularly in

Australia and Japan.²⁸ It was endorsed recently in the Crawford-Okita Report to the Government of Australia and Japan on Australia, Japan and Western Pacific Economic Relations.²⁹

The discussion of the OPTAD proposal over the years reveals four broad aims. First, it was conceived to provide a more effective safety-valve given the high established levels of interdependence, for the discussion of trade and economic grievances among Pacific countries in a rational and co-operative atmosphere calculated not to damage profitable national trading interests. Second, it aimed to provide a stimulus to aid and investment flows for the developing countries of Asia and a framework for a radical improvement in the quality and structure of their aid, investment and trade relations with developed countries in the Pacific. Third, it was to provide a forum for consultation and discussion about the longer-term developments in and economic transformation of the region. A final but absolutely fundamental consideration was the role envisaged for OPTAD in providing a more secure framework of economic alliance among the countries of Asia and the Pacific, an alliance within which participants could feel free to develop closer economic integration in smaller groupings and through which participants could play a less suspect and more constructive role in the expansion of relations with China, the Soviet Union, and the Indochina states after Vietnam.³⁰

The establishment of an Organization for Pacific Trade, Aid and Development which served these aims could effectively weld together the three major strands in relationships among Asian Pacific countries: the crucial economic links with Japan and the United States; the political, diplomatic, and economic involvements with the developing nations, both non-communist and communist, in the Western Pacific region; and the strategic interest in stable and constructive relationships among the super-powers in East Asia and the Pacific.³¹

It was envisaged that OPTAD should develop along the lines of the OECD in Europe, not as a regulatory agency but as a place where government-to-government consultations could take place.³² There would be similarities with the OECD would essentially provide a forum for discussion of problems arising in the special context of Pacific economic interdependence and a framework for devising joint policy

approaches towards them as required. Yet to a large extent the similarity would end there.

OPTAD was not conceived as a substitute for the OECD in the Asian Pacific region, or as an elaborate replication of it. The OECD is an international body which comprises all the major non-socialist developed states, including the United States, Canada, Japan, Australia and New Zealand from the Pacific region. Unlike the OECD, OPTAD would aim to involve participation from the North and South, although the major Pacific powers would certainly have to make the initial running. In its purposes it would serve the objectives of GATT and UNCTAD, for example, on the trade side. But OPTAD's focus, unlike the focus of these bodies, would not be on generalities but on the practicalities of implementation in a specific context.

Setting up an Organization for Pacific Trade, Aid and Development did not imply the development of any elaborate new institutional arrangements. It was seen rather as involving a purposeful association among the regional powers in their seeking, as the occasion demanded, to take initiatives in areas of common policy concern. Thus, OPTAD could provide the focus, a point of reference for thinking in "Pacific" terms and for building a practice of co ordination and co-operation in the Pacific.³³ Its foundation would have to flow from the highest policy commitments by the major regional powers to assisting regional development and building upon regional economic security, and firm policy undertakings on key aid, investment, and trade questions to serve those objectives.

These issues could, it might be thought, be taken up unilaterally or bilaterally but progress in that context comes slow and late, especially where the overlap of third-country interests in the region, because of the nature and growth of regional interdependence, assumes such importance. An advantage of regional action over the unilateral or bilateral approach is, additionally, that it is usually easier for governments to gain political support for concessions if they are part of a multilateral undertaking when others are also seen to be doing their share and where it is well understood that the consequences of renegeing are much wider than in most bilateral bargains. The

willingness of political parties and bureaucracies (reflecting as they do established and opposing domestic interests) to respond to the call for concessions is greater when negotiations are not a bilateral test of strength with a single identifiable opponent, and to concede is an admission of defeat.³⁴ This seems particularly but not exclusively the case with Japanese negotiators (they were well matched in this respect by their Australian counterparts in the recent negotiation of the Treaty of Friendship between the two countries) who in one to one negotiations are extraordinarily tenacious but who compromise more readily in multilateral settings.

The areas of interest to an association among the economic powers in the Pacific must include attempts to negotiate difficult resource supply and development issues, in which both Japan and the United States have such an exceptionally large stake.³⁵ If there is to be an effective resolution of interests among the nations of the Pacific, the resource security question has to be related to the broader regional development issues and improved arrangements for aid, investment flows and trade access, as well as the issue of relations with countries outside the region.

3. OPTAD and Resource Security

The resource trade is at the nub of economic interdependence in the Asian Pacific region. Even the trade between Japan and the United States, the two industrial giants of the Pacific region, still has a large vertical component -- the exchange of primary goods for manufactures. This contrasts markedly with the character of Western European economic integration. In 1974 some 53 percent of imports by the advanced Four from the Western Pacific area comprised raw materials.³⁶ Significantly because of Japan's position, raw materials trade-dependence is extremely high. In 1974 Japan alone accounted for around 40 percent of world imports of basic ferrous and non-ferrous ores and concentrates. Japan and the United States together took 52 percent of world imports of minerals, excluding petroleum, and 37 percent of crude petroleum imports.

The diversity of raw material resources, the scale of reserves

throughout the Pacific, and the economics of proximity³⁷ dictate an extremely heavy concentration of raw material supplies within the region itself. The intensity of intra-Pacific trade in minerals is very much higher than it is even for commodity trade in general. Indeed, the Pacific Five, with little exception, obtain around half their basic mineral import requirements from among themselves. Crude petroleum alone is largely sourced outside the region. These five countries in turn each obtain upwards of 90 percent of their mineral import needs, excluding oil, from the wider Pacific Basin group, including the Latin American and Caribbean countries. Again, nearly 70 percent of low-cost uranium reserves are located in the Pacific, the only major alternative supplier outside being South Africa.³⁸ If uranium is taken as an intermediate-term oil substitute in electricity generation, to a remarkable extent the resource supply problems of Pacific countries have a sharply regional focus.

At the beginning of this decade, concerns about resource and food security emerged as a major issue because of: rapidly escalating oil prices and the success of the OPEC group of oil exporters in raising oil revenues from 1971, and particularly after October 1973; the experience of the commodity boom and shortages of 1973; the application of United States export controls on soy beans in order to avoid "unacceptable" domestic price rises; the scramble for sovereignty over sea resources; and the newly perceived bargaining power between the resource-rich developing countries and the resource-importing developed countries.³⁹ The OPEC arrangements for oil, the use of the oil embargo for purposes of political bargaining, and the expressed desires of other countries to move in the same direction all served to dramatize the issue of raw materials access. The industrial countries, and particularly Japan, were faced with a high degree of uncertainty about their access to raw materials supplies for the first time in twenty years.

The coincidence of the energy crisis with world food shortages had a profound effect on the Japanese outlook towards resource and food security.⁴⁰ Throughout the 1960's, Japan had profited from the generally favorable situation in the global supply of natural resources in a buyer's market. The price of crude oil actually fell

between 1948 and 1970 and Japan's heavy industrialization program was favored by cheap energy supplies. By the end of the 1960's, the basic change which was taking place in the world supply and demand equation had become evident in oil bargaining power and the spectacular increase in world demand for raw materials around this time threatened future scarcities. The Club of Rome forecasts of long-term scarcity made these early concerns about resources shortage in Japan doubly plausible. There were those who anticipated the requirements of these changes for Japanese raw material import policy: "...Japan's dependence on imports of raw materials, energy and food is so complete that policies attempting self-sufficiency in any of the key items appear unrealistic. Diversifying sources of supply, economizing on the use of raw materials and energy, stepping up efforts for increased production from indigenous resources, and building up emergency stocks of energy and food -- all these are feasible and should be pursued with seriousness. But the basic character of heavy dependence for key items from overseas resources will not change."⁴¹ The Japanese Ministry of International Trade and Industry held the view that the promotion of development import⁴² of overseas resources would be the central focus for future resources development policy.⁴³ Japanese firms were encouraged more actively to seek ownership and involvement in the development of foreign resources for supply to Japan. Not unexpectedly, the experience of these years induced a very similar response in the rest of resource-deficient East Asia, especially in South Korea.

About half of Japan's raw material needs are drawn from developing countries, largely Pacific Basin countries. The concerns about resource security elevated foreign assistance directed towards the concessional financing of resource developments to a new primacy in Japanese aid programs and Japanese aid programs are overwhelmingly concentrated in the Asian Pacific region, with the obvious exception of growing interest in the Middle East.⁴⁴ In concessional financing activities, some governments and agencies are attracted simply by the prospect of making a large loan to advance a project that is likely to be well managed and very likely to yield a high economic return. Some see the provision of funds simply as promotion of exports of machinery

and materials. Others are keen to improve the competitive position of their national companies, or are vulnerable to pressure from those companies. These factors are all present in the Japanese program, but the main anxiety has become to increase world availabilities of resource-based commodities.

4. Foreign Assistance to Resource Developments

It is still true, despite the fashion for rural development, that foreign governments and international agencies tend to provide concessional funding for large resource developments more readily than for other activities. For example, the government of a developing country could fund several times over a large power facility that was in part designed to serve a new oil field or nickel mine, but would have very great difficulty in marshalling overseas support for a program of small-scale village electrification that made similar demands on financial resources. At the same time as the availability of capital for resource developments from foreign official sources provides opportunities for strong income and revenue growth in recipient countries, it raises complex problems for economic policy-making and administration. It also raises the questions of effective national sovereignty over development priorities, and of its antithesis, "neo-colonialism."⁴⁵ These issues are at the heart of the problems that have emerged in relations between developing country suppliers and industrial country consumers of raw materials. And the potential for conflict over resources is embedded in the structure of established approaches to these questions. It is, incidentally, in this context -- the context of managing the international political order -- more than in the context of securing its own resource availabilities, although this is no longer an insignificant problem, that there has been some movement in the posture of the United States towards resource-rich developing country interests.

There are many mechanisms through which foreign governments and international agencies make funds available on concessional terms to resource investments in developing countries. The general effect of

the provision of these funds is to reduce the supply price of investment directly, or to reduce the opportunity cost to host governments of funds allocated to resource developments.

One common mechanism is for funds to be made available to the host government for the financing of commitments that it enters in relation to resource investments. Infrastructure is sometimes made available directly as project aid. Some governments in industrial countries make concessional funds available to their national investors for mineral exploration and development. Loan funds are made available to the operators of a project for the purchase of equipment or for other purposes. Assistance in any of these forms may be tied to purchases of goods and services from the donor or lender, or untied. In addition, what evidence there is suggests that the private international capital markets provide finance more readily to governments for resource development than for their general development programs, although access to private capital markets is far from adequate.

The effective grant element in such funding and so the real effect on the supply price of capital or on the opportunity cost of finance to the home government, depends on the extent to which it is tied to purchases in the donor country, and on the extent to which the home country is a competitive supplier of goods and services required by a resource project, including management services.

Conflicts among the different motives of a donor country affect the terms upon which finance is made available. The conflict in Japan over time between the resource-trade expansion and the export promotion motives provides an interesting example. Japanese authorities appear to have decided to let their interest in the expansion of overseas petroleum production override their interest in the promotion of industrial exports. The only major cases of Japan making concessional funds available to foreign governments on a completely untied basis in its bilateral programs involve loans for petroleum exploration and development in Indonesia and Burma. Multilateral aid is a very small proportion of total aid flows from Japan.

The effect of concessional funding of resource projects on returns to the recipient country depends on the particular way in which

it is made available as well, of course, as on the recipient country's ability to administer projects and taxation effectively. The provision of finance directly to national investors of the donor country reduces the supply price of investment from this source. It also reduces the supply price of investment to the project if the particular recipients are competitive investors in the absence of assistance. However, if the assistance is required merely to make the recipients competitive with nationals of other countries, there may be no reduction in the supply price of investment to the project and no increase in profitability.

The provision of concessional funds to the operators of a project independently of their nationality, as is usually the case with equipment loans, lowers the supply price of investment and increases profitability so long as the concessional element in financing exceeds any cost of tying.

The direct provision of infrastructure lowers the supply price of investment and increases the amount of rent. The provision of concessional funds to the host government reduces the opportunity cost of purchasing equity or installing infrastructure, and so provides for potential increases in taxable profits. Where concessional finance promotes a sub-marginal project, however, it may not contribute to profitability and may be dissipated without significant benefit to the recipient country.

The availability of concessional finance for resource developments raises difficult problems of economic policy administration for developing countries. The major dilemmas are associated with difficulties in determining the true opportunity cost of public expenditure on resource projects that are financed with foreign assistance. It is well established that aid is used most effectively in terms of the priorities of the recipient countries if it is untied and made available in support of the total development program of the recipient country. Aid for resource developments poses all of the usual problems of tied aid and project aid, although often in an extreme and politically prominent form because of the scale and impact of the projects involved. Such aid may still appear better than

nothing. It is likely to be better than nothing, possibly much better, when its availability reduces the supply price of investment and increases government revenues from the mines. However, there are circumstances in which it can be worse than nothing, and it is always difficult for a recipient government to judge whether the alternative really is nothing rather than some less restrictive form of aid.

There are three circumstances in which the acceptance of aid to resource projects might bring negative net benefits to a recipient country. The first is where the availability of concessional funds from a particular source leads to the inefficient use of a valuable resource. This will only occur where there is an inefficient administrative system within the host country, but unfortunately there are many examples of inefficient administrative systems in the developing world. The second circumstance is where the recipient government's financial commitments to a project exceed the concessional element in the foreign funding, and where the taxation on the rents generated by the investment is less than this shortfall. The third circumstance is where the resource project, with effective concessional financing, itself is less than this shortfall. The third circumstance is where the resource project, with effective concessional financing, itself brings positive net benefits, but where the acceptance of aid that is specific to resource investments reduces the amount of aid from the same source that is available for other higher priority purposes. It is always difficult for an aid recipient to identify the latter circumstance in practice, and high orders of political judgment are required in the administration of policy in this area. Recipients of large quantities of concessional assistance are soon left with very little control over the directions of national development effort if the terms upon which aid is provided by all donors deteriorate to the lowest common denominator among existing forms of aid.

These are not insignificant problems for Pacific Basin developing countries in the receipt of foreign assistance for resource development projects. Indeed, they are problems quite endemic in the structure of concessional financial flows, not only resource developments but also for industrial development, under bilateral assistance

programs throughout the region. Specifically, the "development import" strategy which has been favored by Japanese policy-makers, embodies concessional financing to national investors and pervasive aid tying in a way which may have serious costs to recipient countries and may corrode the stable long-term trade, investment and assistance relationships between Japan and these countries as a whole. The effects of these practices in economic and political relations with recipient countries are increasingly well recognized by aid administrators in Japan and alternative forms are being sought⁴⁶ which aim to eliminate the weaknesses in policies which have the completely legitimate aim of securing resource availabilities, but have tended to understate the recipient interests in what should and can be a mutually beneficial trade, aid and investment relationship.

These problems in relationships with Pacific Basin developing countries are not Japan's alone, although her resource security interest makes her prominent in the resource field. The focus of American, Canadian, and Australian private and official interest in resource development in the Pacific Basin would seem to suggest powerful reasons for joint initiatives in their approach to development assistance policy throughout the region. Critically these initiatives should involve commitment to procedures for more general and effective untying of development assistance flows and complementary measures for removing distortions in international capital markets which adversely affect the interests of developing country raw materials producers, as well as the creation of an enlarged pool of funds for resource project financing.

Within the OPTAD framework the Pacific Five could enter firmer commitments to generalized aid untying. However, institutional structures are such that it would be difficult to expect the generalized formal untying of concessional financial flows in the region very rapidly. In this event, a few relatively simple innovations in the systems within which aid is administered in recipient countries could remove the major distortions that are associated with project aid and tied aid, without requiring radical changes in the formal conditions that are usually applied to government-to-government assistance in the

financing of resource investments. Nonetheless, important changes may be required in some current practices.

Government-to-government transactions would be very much more manageable if they first took the form of a commitment to provide a specified level of aid over a period of years. Secondly, the funds represented by this commitment would be made available to support a specified range of activities, including major resource investments where government expenditure on these activities survived a listing of the recipient's priorities. The aid would be portable across the listed activities. Thirdly, the commitment could be drawn down selectively against purchases from sources to which the particular donor expected its aid to be tied. The Pacific Five could announce whatever direct aid untying was possible as a first step, and agree as a second step to enter arrangements under these principles with individual developing countries or groups of Pacific Basin developing countries such as the ASEAN group as they wished to participate in this effective untying measure.⁴⁷

These measures could be built around the provision of a new and expanded pool of funds to finance resource projects, on both concessional and commercial terms, through a Pacific Resources Bank (PRB). The PRB would be a specialized lending institution which directed capital for major resource projects into both developing and developed countries around the Pacific Basin. It would serve some of the functions of the International Resource Bank which was put forward at Nairobi⁴⁸ but it would not have institutional association with the World Bank Group. It could evolve, for example, as a joint facility of national funding institutions. Apart from a financing function, it could also provide important "packaging" facilities for developing country borrowers seeking to initiate resource projects with a larger domestic capital component or commitment to the establishment of a Pacific Resources Bank by the Pacific Five could help to fill a real gap in the international capital market.

5. More Efficient Private Investment Flows

There are four issues related to the efficiency with which the private market allocates investment into resource-based activities on the agenda for OPTAD. The first has been raised in the discussion of foreign official development assistance above, namely the difficulty that may arise in seeking an efficient allocation of investment funds when concessional finance is provided directly to the national investors of donor countries. The second, also mentioned above, is the problem of developing country access to private international capital markets and loan funds on a commercial basis. The third is the problem of instability in commodity markets and its effect on the supply of private and government funds for, and policies towards, resource projects in developing countries. And the fourth is the problem of myopia in private investment decision-making, induced by national institutions, associations and ties, that limits the efficient relocation of minerals processing, smelting, and refining activities, and thereby the economization of resource and energy use throughout the region. These are major issues and deserve brief review here.

There is no simple expedient for managing problems associated with the provision by donor countries of finance to their own national investors without donor co-operation. In practice, a recipient government can do no more than insist that such transactions are not aid in any sense -- that they are simply a domestic transaction between the foreign company and its own government. The recipient government can then accept proposals on their competitive merits from all foreign investors that are interested in a project, without representation from foreign governments. There are potential threats to effective national management in these types of arrangement, and a host government is wise to insist on full declaration of such transactions between a foreign investor and his home government. A regional organization could encourage this principle through the implementation of a code of foreign investment which insisted on declaration and provided no guarantees without it. In time, it may well turn out to be practical to enter into a convention, akin to the Basle Convention on export

credits, which governed inter-national competition through assistance of this kind, although that is not a crucial aspect of the problem from the viewpoint of the recipient country.

The emergence of the Eurodollar market over the last decade and a half has contributed to the vast improvement and expansion in the allocation of international loan capital.⁴⁹ The growth of this market (and the infant Asiadollar market) has circumvented many of the rigidities and restrictions on funding through foreign "national" capital markets and facilitated rapid adjustments in patterns of investment and trade, the size of which the world has rarely known. Moreover, access to commercial loan capital through these markets is more readily available for resource project investments than it is for most other projects. Yet there remain problems of access to commercial capital markets for developing countries. These problems are not simply a function of fundamental credit risk but are also a function of the bias in lender perceptions which are a product of institutional experience, historical associations and business ties. These observations, of course, apply much more strongly to foreign "national" capital markets, capital flows to the developing world from which are largely confined to former colonies or countries and projects which are assigned national priority by the lender country's government or official lending agencies. On the one hand, projects in all but a very few Pacific Basin developing countries, including Latin America, have very limited direct access to foreign commercial markets, and then largely through the intermediation of national concessional lending institutions or through the intermediation of large corporations of international repute. On the other hand, there is a need to diversify direct private investment interests in resource projects and a desire by some countries for an increased role for domestic equity. Both sides of the problem are particularly acute in the Pacific Basin region, and focus on the difficult position of Japan. Creative private financing through multinational consortia arrangements can sometimes offer a way out of the dilemma of reconciling limited channels of finance with the diversification of financing objective.⁵⁰ But too often the only alternative seems the "development-import captive mine"

approach.⁵¹ The Pacific Resources Bank, suggested above, could play a major role in breaking down these rigidities in resource project financing. The Pacific Five could extend loan guarantees through the national institutional lenders, such as the Export-Import Banks Pacific Basin countries.⁵² These guarantees would not have to cover an entire loan to serve the useful function of encouraging closer examination by investors of the projects and needs of developing countries in the Pacific Basin.

The problem of instability in commodity markets has been around as a major international economic policy problem for a very long time. However, the concentration of resource and agricultural commodity trade within the region gives this problem a particular Pacific dimension which may be amenable to amelioration through regional action. In this context, the Japanese initiative to consider a Pacific Basin Stabex-type arrangement deserves Pacific Five support although the direct national interests of other advanced Pacific countries are smaller than those of Japan.⁵³ Within the OPTAD framework, a Stabex-type arrangement could help to ease the economic management problems of the smaller resource-rich states and thereby reduce the susceptibility, in private and public programs, to underinvestment in resource supply.

The final problem concerns the efficacy of the private market in effecting efficient re-location of resource processing, smelting, and refining activities. The advantages of the re-location of resource-intensive industries outside Japan and the United States from an energy and resource-saving viewpoint have been detailed many times in the Pacific Trade and Development Conference series.⁵⁴ Smith records again the strong interest of advanced-country resource suppliers, such as Australia, in a major transformation of resource industry specialization within the region.⁵⁵ OPTAD was, from its very conception, seen as an important mechanism whereby to create the confident environment within which this transformation could take place more rapidly than it so far has.⁵⁶ This role is underlined in a period of uncertainty about the long-term investment climate. The importance of the security that could be provided by the OPTAD framework to Japanese policymakers and

businessmen in planning a long-term industrial policy strategy aimed at significant re-location of processing, cannot be overstated.⁵⁷ To help overcome caution, the need to define a confident environment for new international specialization through energy and resource-saving industrial re-location in the Asian-Pacific region is more powerful now than it has ever been.

6. Energy Security

The Pacific Five have managed their own high levels of economic interdependence less than disastrously although it is not perhaps sufficiently well understood how deep were the strains among even these countries during the years of the monetary, resource and oil crises. They will continue to have common if sometimes conflicting, interests in trade liberalization, rules for foreign investment, the control and use of ocean resources and other issues. But by far the most important issue in their relations over the next generation will be how to manage the adjustment to the era of high oil prices and the supply and price of other energy sources, though each from quite different perspectives. Undoubtedly one of the most serious and fundamental differences between Washington and Tokyo in the first half of this decade was the product of divergent perceptions of national and collective interest before and during the oil crisis, especially from the spring of 1973.⁵⁸ For the United States, energy is closely related to concerns about national security. The Japanese concern about energy is primarily economic. In the case of oil, these concerns have to be seen in a global context, especially because it is largely Middle Eastern oil on which the United States seeks to reduce its dependence and on which Japan must continue to rely for primary energy supplies for the coming decade. These conditions will not change quickly. Assured oil supplies will remain vital to Japan for some time. While the fears in Japanese officialdom and among the community at large about the unavailability of oil supplies for significant periods in the coming decade might rightly be regarded as highly exaggerated, they are a critical factor in the Japanese response on a number of related issues;

they will have to be accommodated. As Patrick observes:

Japanese economic and American security interests thus converge in having the United States develop its own energy reserves. Such an American policy would increase world supplies; alternatively viewed, it would reduce American demand for Middle Eastern or other foreign oil....This could leave Japan as the major buyer of Middle Eastern and perhaps other) oil, providing it strong bargaining power. However, this is not a possibility that Japanese yet regard as likely, nor can their policymakers operate on such an assumption. In addition to the extent that American energy independence is achieved through extensive, and expensive research and development efforts which are economically premature, other countries will benefit in the long run. This technology will become available, and inevitably in substantial part at low cost, to countries able to use it; Japan would be a prime beneficiary.⁵⁹

Access to energy technology is the nub of current negotiations over the nature of the role to be played by nuclear energy.

In April 1977, United States President Carter, outlined a policy on nuclear energy which he hoped would be accepted internationally.⁶⁰ The thrust of his proposal was to limit the sale of uranium to countries which wanted to reprocess it after use, and which were seeking to develop Fast Breeder Reactors (FBRs). He saw this proposal as a major arm in limiting the threat of the proliferation of nuclear weapons. The proposal has three important implications.

First, preventing "tails" from being reprocessed would lead to increased demand for unenriched uranium. This may force prices up depending on the supply response under reduced proliferation risk, but more importantly it would imply a continuing reliance on foreign supply sources by Japan in particular. Second, it would protect United States interests, in the structure of the proposal, in so far as the United States has relatively abundant uranium reserves as well as alternative domestic energy sources. Japan does not and continues to discount the steaming coal option heavily for environmental reasons. However, there is also the possibility that the Europeans and Japanese could turn to the Soviet Union for supplies of enriched uranium and these risks for the United States have to be considered. Third, the proposal

could be interpreted as a defense of the United States strategic position as it aims to keep nuclear weapons within the hands of the present number of nuclear weapons states.

The Japanese and Europeans, particularly the French, have not welcomed the specific restrictions on reprocessing contained in the Nuclear Non-Proliferation Act of 1977. The Japanese suggest that a more appropriate way to handle the uranium issue is not to prevent reprocessing or stifle the development of FBRs, but to look to ways of improving safeguards.⁶¹ In the event the United States and Japan effectively put their conflict over this issue on the back-burner by agreeing to proceed with the "experimental development" of Japanese facilities at Tokai Mura over the next two years. This had the effect of resolving at least temporarily the conflict between the United States and Japan, but the Japanese will now be confronted by the specific restrictions on reprocessing contained in the Nuclear Non-Proliferation Act of 1977.

In its commitment to uranium export, the Australian government faces the dilemma of interest in the economic return from uranium and growing concern among the electorate about the proliferation and environmental issues.⁶⁴ The Government's support for the non-proliferation objectives of the United States as well as its appeal to a "moral responsibility"⁶⁵ to mine and export uranium, can be interpreted as an attempt to accommodate both elements in public opinion. The Canadian dilemma is not dissimilar, although it has different expression, involves less concern about environmental questions, and has its origins in experience with the administration of safeguards and a broad consensus on the proliferation question.

The negotiation of these issues encapsulate in extreme and sensitive form the very real interests at stake for the Pacific Five in regional co-operation and the potential for political and economic conflict if there is any solution which does not involve a commitment which is commonly acknowledged. In these affairs bilateral bargaining, or even arms-length quadrilateral bargaining, seems less likely to produce such common commitments than might be achieved within a framework like that which could be provided by OPTAD. Through an

Energy Consultative Group in such an organization, the Pacific Five, working from the assumption of providing mutual energy security, could advance economic and political strategies for effecting the energy transformation. This would not preclude or hamper the pursuit of mutual interests elsewhere, in the Middle East, with Europe, and with the Soviet Union. Indeed, the capacity to provide a measure of energy security within the Pacific Five, not only on the basis of uranium supplies but also on the basis of coal supplies, could be used construct vely in the pursuit of regional objectives elsewhere.

7. Agenda for Action

In the resource trade field the coincidence of regional interests is remarkably strong. Approaching the resolution of these interests through a regional association like OPTAD has much to commend it. My review of the sort of role that OPTAD might play in strengthening resource trade security suggests in itself an impressive agenda for action. And a whole range of issues in other fields, discussed elsewhere,⁶⁶ are not included here. Yet OPTAD, as I see it, would not set out to define the nature of growth in regional relations from the beginning. Unlike PAFTA, which had quite specific objectives, OPTAD could be seen as a more realistic expression of political realities. It seeks to take advantage of existing institutional arrangements, building ties at the highest level. In contrast to the OECD, which serves the interests of the North Atlantic community and the more general interests of developed countries, OPTAD would serve different aspects of interests of some of those states (the Pacific Five), as well as bringing less developed countries into a more active process of consultation. Compared with Europe, the Pacific Basin countries have a huge potential for development, since the region encompasses a diversity of young resource-rich countries and growing industrial economies. Economic development is therefore a primary objective and remains so even in the depths of the worst recession in industrial economies since the 1930s. By contrast, stabilization and protection of the present international order appear to dominate the interests of

Europe and the Atlantic. Trilateral interests need to be built on the strength and vigor of the Pacific, not as an appendage of the Atlantic Community.

The purpose of OPTAD, then, would certainly not be to duplicate the functions of the OECD, or the functions of other existing international bodies. The bureaucracy which accompanies the OECD is extensive and in many ways cumbersome. What is required in the Pacific is, if it must be called an organization, a loose organization whose two main bodies would be a council (similar to the OECD council, and made up of Heads of State and senior bureaucrats) which met from time to time, and a skeleton secretariat which fulfilled organization requirements, serviced ad hoc Task Forces initiated by the Council, and commissioned small research projects. Task Forces might be appointed on specific problems as the need arose. The framework envisaged for OPTAD reflects the fact that many of the problem areas -- particularly in economic relations -- have a significant political component. Discussion and bargaining do not require sophisticated support apparatus. Participation would require commitments and responsibilities in the conduct of various facets of foreign economic relations and could be comprehensive or limited.

Discussions of the OPTAD proposal have tended to focus on its function as a way of promoting trade liberalization and it has been conceived of as part of a move toward world free trade. This emphasis tends to obscure the much more important role OPTAD could play in other fields which have been stressed here. In the present climate and the context of growth and change that characterizes the Pacific Basin region, low-key consultation and the creation of confidence in an OPTAD would be very valuable.

An agenda for action might include the following issues identified in the argument above:

1. Energy security: Commitments to underpinning energy security and consultation on energy policy issues by the Pacific Five in the form of an Energy Consultative Group.
2. Resource security: Access to markets and raw materials under stable long-term arrangements.

3. Resource development: Commitments to the effective untying of development finance generally, under arrangements with individual states, or under arrangements with groups like the ASEAN group, and improved access to capital markets through the establishment of a Pacific Resources Bank or in other ways.
4. Commodity market stabilization: Commitments through the introduction of a Stabex arrangement to insulate against variable export earnings in developing countries.
5. Trade re-structuring: Promotion of resource and energy-saving industrial re-location. In this field and the field of resource development, developing a code for foreign investment that encouraged formulae for non-bilateral investment ties is crucial. Clearly, a whole range of other issues such as trade access for industrial goods; agricultural market access and access to fisheries resources; arrangements to cover access to ocean resource; the development of a regional approach towards Europe; and the approach towards Indo-China, China and the Soviet Union, would also be on the negotiating table, but sensibly not all at once. This kind of agenda is formidable but provides much upon which to build the practice of Pacific Consultation and co-ordination.

There have probably been few more opportune times for Australia Canada, Japan, New Zealand and the United States to take the lead in the establishment of OPTAD, perhaps through a Heads of State meeting and hence to a Task Force review, in the regional context of their commitment to the development objectives. From this could flow initiatives consistent with their own interests in economic and resource security as well as with developing country interests, in a more equitable deal on aid, investment, and trade matters. In particular, the problems with ASEAN have given Australia and Japan both more reason and more freedom to move in this direction. And for its part, the United States, with new leadership, seems likely to have every incentive to join in a constructive endeavor towards that part of the developing world in Asia and the Pacific, and its other Pacific partners, both to provide witness of its good intentions as well as to strengthen its own economic security.

FOOTNOTES

¹I am grateful to James Horne for research assistance and contribution to the argument of this paper. The paper also owes much to Ross Garnaut, on development assistance policies, and Charlotte Williams, on the politics of Pacific economic co-operation. The interpretations are, of course, my own.

²Charlotte Williams, "The Pacific Community: A Modest Proposal," Australia-Japan Economic Relations Research Project Paper (forthcoming) pp. 1-2 reviews these developments in political context. An earlier version of this paper was presented to a joint seminar of the Australia-Japan Project in Canberra, September 1976.

²Ibid., p.1.

³The Asian-Pacific region is the term commonly used in the Japanese literature. Williams calls this group the Pacific Basin countries.

⁴J.G. Crawford, Saburo Okita, et al. Australia, Japan and Western Pacific Economic Relations, a Report to the Governments of Australia and Japan, Australian Government Publishing Service, Canberra, 1976, pp. 25-30.

⁵Kiyoshi Kojima Japan and a Pacific Free Trade Area, Macmillan, London, 1971, Chapters 1 and 3.

⁶J.G. Crawford, Saburo Okita, et al., op. cit., Chapters 2, 5 and 6.

⁷Harry G. Johnson, "World Trade Policy in the Post-Kennedy Round Era. A Survey of Alternatives with Special Reference to the Positions of the Pacific and Asian Regions," Economic Record, June 1968; Kiyoshi Kojima, op. cit., Chapter 3.

⁸Kiyoshi Kojima, op. cit., Chapter 7. The Asian-Pacific area is defined here so as to include Canada and the United States. Hence growing continental North American trade inflates the degree of regional trade to an extent, although the significant growth was in the Western Pacific.

⁹Peter Drysdale, "Minerals and Metals in Japanese-Australian Trade," The Developing Economies, Vol. VIII-II, June-1970, pp. 198-218.

¹⁰Peter Drysdale, ed., Direct Foreign Investment in Asia and the Pacific, (Proceedings of the Third Pacific Trade and Development Conference) Australian National University Press, Canberra, 1972, Chapters 2 and 14; Stephen W. Kohlhagen, "The Characteristics, Motivations, and Effects of Japanese and United States Direct Investments in the Pacific Basin," IMF Stagg Papers, Vol. XXIII, No. 3, November 1976.

¹¹J.G. Crawford, Saburo Okita, et. al., op. cit., Chapters 8 and 9.

¹²For a fuller discussion of the different emphases in Australian and Japanese aid programs see, Nancy Viviani, "Australia and Japan: Approaches to Development Assistance Policy," Australia-Japan Economic Relations Research Project Paper, Canberra, December 1975

¹³Peter Drysdale, "Pacific Economic Integration: The Evolution of a New Approach to Regional Trade and Development Policies," Australia's Neighbors, October-December 1968.

¹⁴Mr. Miki's opinions have been presented in speeches delivered at the Conference for the Development of Southeast Asia, held at Manila in April 1967 and at a monthly meeting of the Keizai Doyukai (Committee for Economic Development) on the subject of Asia-Pacific Policy and Japan's Economic Co-operation, Hugh Crobet, ed., Trade Strategy and the Asian-Pacific Region, George Allen and Unwin, London, 1970, p. 82.

¹⁵Kiyoshi Kojima and Hiroshi Kurimoto, "A Pacific Economic Community and Asian Developing Countries," Hitotsubashi Journal of Economics, June, 1966, pp. 17-37. Also in Japan Economic Research Center, Measures for Trade Expansion of Developing Countries. Tokyo, October 1966, pp. 93-134.

¹⁶A series of nine Pacific Trade and Development Conferences have been held to date. The First Pacific Trade and Development Conference in Tokyo examined the Pacific Free Trade Area proposal and alternative trading arrangements. The Second Conference, in Honolulu, considered explicitly the interests and needs of the developing nations of the Pacific; the Third Pacific Trade and Development Conference was held in Sydney in August 1970 on issues of private direct investment in the Pacific region. A pattern had emerged which has resulted in the continuing series and in the organizational arrangements thereof. The Fourth Pacific Trade and Development Conference, on obstacles to trade in the Pacific area, was held in Ottawa in October 1971; the Fifth, on structural adjustments in Asian Pacific trade, was held in Tokyo in January 1973; the Sixth, on technology transfer in Pacific economic development, was held in Mexico City in July 1974; the Seventh, on relations among the larger and smaller nations of the Pacific, was held in Auckland in August 1975; and the Eighth, on trade and employment, was held in

Thailand in July 1976. The Ninth Pacific Trade and Development Conference, on the theme of the production, processing, financing, and trade of natural resources in the Pacific Basin, was held in San Francisco in August 1977. Conference papers and proceedings have been published, in sequence: Kiyoshi Kojima, ed., Pacific Trade and Development, Japan Economic Research Center, Tokyo, February 1968; Kiyoshi Kojima, ed., Pacific Trade and Development II, Japan Economic Research Center, Tokyo, April 1969; Peter Drysdale, ed., Direct Foreign Investment in Asia and the Pacific, Australian National University Press, Canberra, 1972; H.E. English and Keith Hay, eds., Obstacles to Trade in the Pacific Area, Carleton University, Ottawa, 1972; Kiyoshi Kojima, ed., Structural Adjustments in Asian-Pacific Trade, Japan Economic Research Center, Tokyo, August 1973; Kiyoshi Kojima and Miguel S. Wionczek, eds., Technology Transfer in Pacific Economic Development, Japan Economic Research Center, Tokyo, January 1975; L.V. Castle and Frank W. Holmes, eds., Co-operation and Development in the AsiaPacific Region - Relations between Large and Small Countries, Japan Economic Research Center, Tokyo, 1976; and Narongchai Akrasanee et al., eds., Trade and Employment in Asia and the Pacific, University of Hawaii Press, Honolulu, 1977.

A major joint research project undertaken by a group of Australian economists centered on the Australian National University and a group of Japanese economists working from the Japanese Economic Research Center under the direction of Sir John Crawford and Dr. Saburo Okita has published, and continues to publish, a considerable volume of work on Australia, Japan, and Western Pacific economic relations. See J.G. Crawford, Saburo Okita, et al., op. cit.

¹⁷In particular through regular bilateral Ministerial Meetings among the Pacific Five and bilateral meetings among officials. The Australian and Japanese Governments have recently concluded a Treaty of Friendship and Cooperation, the objectives of which were to define most favored nation treatment over a wide area of both countries' relations in trade, investment, personnel transfer and "to provide a secure framework for an on-going process of further negotiation and arrangements on specific matters and thereby a powerful centripetal force in Australia-Japan relations." See J.G. Crawford, Saburo Okita, et al., op. cit., pp. 133-134

¹⁸In Japan, senior Cabinet Ministers in successive governments have broadly endorsed the concept, among them Miyazawa, Ohira, Nakasone and, of course, Miki. The idea of an Organization for Pacific Trade Aid and Development appears to have a measure of bipartisan political support in Australia and was recommended strongly by the Australian Senate's Joint Party Standing Committee on Foreign Affairs and Defense, Japan, Australian Government Publisher, Canberra, 1971, pp. 69-70, 81. Interest in the United States was reflected in policy soundings throughout the region in 1973 and 1975. See also Richard Kosabud and Houton Stokes, "Trade Peace in Pacific Through a Free Trade Area," Journal of International

Affairs, Vol. 28, No. 1, 1974, Jerome B. Cohen, Pacific Partnership: United States-Japan Trade Japan Society Inc., New York, 1972; William Diebold Jr., The United States and the Industrial World: American Foreign Economic Policy in the 1970's, published for the Council on Foreign Relations by Praeger Publishers, New York, 1972; Allen Taylor, ed., Perspectives on U.S. Japan Economic Relations, Ballinger Publishing Co., Cambridge, 1973; Harold B. Malmgren, Pacific Basin Development: The American Interest, published for the Overseas Development Council, Livingstone Books, 1972; Harold B. Malmgren, "Japan, the United States, and the Pacific Economy" Pacific Community, Vol. 4, No. 3, April 1973; and Herman Kahn in Ernest E. Schneider, ed., Report on Corporate Environment Program, Shimoda Conference, Hudson Institute, New York, May 1977.

¹⁹Kiyoshi Kojima, op. cit., June 1966. Takeo Miki, then Japan's Foreign Minister, initiated discussions of the PAFTA proposal among academic economists from the Pacific Five at the first Pacific Trade and Development Conference in Tokyo, January 1968. A review of this discussion and the Kojima proposals appears in Kiyoshi Kojima, op. cit., Japan Economic Research Center, February 1968.

²⁰For a brilliant interpretation of Japanese foreign policy and attitudes to the outside world, see Junji Banno, "Foreign Policy and Attitudes to the Outside World in Modern Japan, 1868-1945," in Peter Drysdale and Kironobu Kitaoji, eds., Japan and Australia: Two Societies and their Interaction, Australian National University Press, Canberra (forthcoming)

²¹Kiyoshi Kojima, op. cit., pp. 165-176.

²²H.W. Arndt, "PAFTA: An Australian Assessment," Intereconomics, Hamburg, October 1976 (reprinted in his A Small Rich Industrial Country: Studies in Australian Development, Aid and Trade, Cheshires, Melbourne, 1968); Parliament of Australia, Japan, Report from the Senate Standing Committee on Foreign Affairs and Defense, Australian Government Publishing Service, Canberra, 1973.

²³H.W. Arndt, loc. cit., see also I.A. McDougall, "Prospects of the Economic Integration of Japan, Australia and New Zealand" in Kiyoshi Kojima, ed., Pacific Trade and Development, op. cit.; and Kiyoshi Kojima, ed., Pacific Trade and Development II, op. cit., passim.

²⁴Peter Drysdale, "Japan, Australia, New Zealand: The Prospect for Western Pacific Economic Integration," Economic Record, September 1969.

²⁵Peter Drysdale, loc. cit.; H.W. Arndt, "Australia's Economic Relations with Japan: Dependence or Partnership?" in J.A.A. Stockwin, ed., Japan and Australia in the Seventies, Angus and Robertson Sydney, 1972.

²⁶Kiyoshi Kojima, "Japan's Interest in Pacific Trade Expansion," in Kiyoshi Kojima, ed., Pacific Trade and Development, op. cit., p. 177.

²⁷Peter Drysdale, "Pacific Economic Integration: An Australian View," in Kiyoshi Kojima, ed., Pacific Trade and Development, op. cit., pp. 208-9.

²⁸Peter Drysdale, "Japan, Australia, New Zealand: The Prospect for Western Pacific Economic Integration," loc. cit., pp. 337-40.

²⁹J.G. Crawford, Saburo Okita, et. al., op. cit., pp. 137-8.

³⁰Charlotte Williams, loc. cit., pp. 14-22.

³¹Nancy Viviani, loc. cit., pp. 85-87.

³²J.G. Crawford and G.H. Board, "Japan's Trade Policy and Trade in Temperate Zone Agricultural Products," H.E. English and K.A.J. Hay, eds., op. cit. The mutual consultation and information gathering role of the OECD is reflected in its conventions and activities. See OECD Summary, prepared for discussion in a Special Session at the Eighth Pacific Trade and Development Conference, pp. 2-3 and pp. 9-29.

³³Charlotte Williams, loc. cit., p. 14; H.E. English, "Ocean of Opportunity? Is the Pacific a Meaningful Concept in Foreign Policy?", Canadian Department of External Affairs, Ottawa, 1976.

³⁴Charlotte Williams, loc. cit., pp. 14-15.

³⁵Peter Drysdale, "Australia, Japan and the Resource Trade," Journal of Japanese Ministry of Foreign Affairs (in Japanese), Tokyo, December 1975.

³⁶Advanced Four are United States, Canada, Japan and Australia. Estimate is based on SITC categories 0-4 inclusive.

³⁷Peter Drysdale, "Minerals and Metals in Japanese-Australian Trade," loc. cit., pp. 198-218.

³⁸The position in respect of steaming coal is essentially the same, except that China plays a part as a Pacific supplier.

³⁹J.G. Crawford, Saburo Okita, et.al., op.cit., Chapter 7.

⁴⁰Shinichi Ichimura, "Japan: The Rising Sun or Sinking Ship: The Energy Problem and the Food Shortage," Center for Southeast Asian Studies Discussion Paper, No. 74, Kyoto, July 1974, p. 1. G.W.P. George, "Japan's Oil Import Policies in the Age of 'Multipolar Diplomacy,'" pp. 27-62.

⁴¹Saburo Okita, "Natural Resources Dependency and Japanese Foreign Policy," Foreign Affairs, Vol. 52, No. 4, July 1974, p. 723.

⁴²Literally translated from kaihatsu yunyu.

⁴³Ministry of International Trade and Industry, "Resources Development and Imports of Japan," Modern Government and National Development, July 1970, pp. 39-45; Ministry of International Trade and Industry, Outlook on Resources Problems, Tokyo, 4 October 1971.

⁴⁴Alan Rix, "The Future of Japanese Foreign Aid," Australian Outlook, January 1978; Nancy Viviani. loc. cit.; West Germany, in its aid programs, also and emphasizes assistance to increase resource availabilities.

⁴⁵Ross Garnaut, "Aid, Natural Resources and Development," paper delivered to the Development Studies Center, Australian National University, Canberra, 15 June 1977.

⁴⁶Kiyoshi Kojima, "Japan's Resource Security and Foreign Investment in the Pacific," paper presented to joint meeting Australia-Japan Economic Relations Research Project, Tokyo, 10 April 1977, suggests a "development import cum long-term contract" approach. This theme is developed further in his paper in these Proceedings. See also J.G. Crawford, Saburo Okita, et al., op. cit., Chapter 8.

⁴⁷The system suggested here is a variant adopted for a single recipient country or a group of recipient countries of a multilateral reciprocal aid untying arrangement discussed by Kiyoshi Kojima, Saburo Okita, and Peter Drysdale in "Foreign Economic Relations," Asian Development Bank, Southeast Asia's Economy in the 1970's, Longman, London, 1971, pp. 327-330. The terms portable aid commitment and selective drawdown of aid have been developed in Papua New Guinea in the process of recent work to strengthen administrative structures for the recipient of foreign aid. The arrangement is set out in some detail in Ross Garnaut, loc. cit., pp. 13-14. Two important features are that goods and services required by each aid-supported activity would be purchased competitively and that program priorities would be determined independently. "Goods and services required by each aid-supported activity would be purchased competitively, through the normal supply procedures of the recipient government. When a source of goods and services to which some aid was tied was revealed to be the most efficient supplier, the aid commitment of the corresponding donor would be run down. The system would clear all aid commitments so long as each donor country was a competitive source of an amount of goods and services required by activities which it was prepared to support that exceeded the amount of its aid commitment. If aid commitments cleared automatically, there would be no distortion in priorities associated with the project orientation of aid and no excess cost of tying. For the donor, aid might appear to be project-oriented and tied, but this would carry no distortions in expenditure and no excess costs for the recipient."

⁴⁸Henry Kissinger, "Address to UNCTAD," Department of State Bulletin, 31 May 1976, pp. 661-62. The suggestion here is not to duplicate or replicate the functions of the World Bank group or Asian Development Bank but to develop a consortium of national institutional lenders that will service the resource-development financing function more efficiently than they do individually.

⁴⁹John White, "External Project Finance in Developing Countries: Institutional Implications of Recent Trends," World Development, Vol. 4, 1976, pp. 411-426; Carlos F. Diaz-Alejandro, "Less Developed Countries and the Post-1971 International Financial System," Essays in International Finance, Princeton, No. 108, April 1975; Constantine Michalopoulos, "Financing Needs of Developing Countries: Proposals for International Action," Essays in International Finance, Princeton, No. 110, June 1975; Morgan Guaranty Trust Co., World Financial Markets, New York, June 1977.

⁵⁰The Inco involvement in the consortium which got the Sulawesi nickel smelting operation off the ground is a good case in point.

⁵¹In Japan, and to a lesser extent Korea, the view that the "captive mine" approach provides the only watertight resource security system, in economic and political terms, remains surprisingly well-entrenched and has had a powerful influence on approaches to foreign investment policy, especially since the experience of the oil crisis. See Kiyoshi Kojima, "Japan's Resource Security and Foreign Investment in the Pacific," op. cit., p. 15.

⁵²Constantine Michalopoulos, loc. cit., pp. 16-17; Henry Kissinger, loc. cit., pp. 661-62.

⁵³Thomas K. Morrison and Lorenzo Perez, "Analysis of Compensatory Financing Schemes for Export Earnings Fluctuations in Developing Countries," World Development, Vol. 4, 1976, pp. 687-94; Alfred S. Friedburg, "The Lome Agreement: Co-operation Rather than Confrontation," Journal of World Trade Law, Vol. 9, 1975.

⁵⁴See also J.G. Crawford, Saburo Okita, et al., op. cit., Chapter 6; and Peter Drysdale, "Minerals and Metals in Japanese Australia Trade," loc. cit., for an early discussion of this issue.

⁵⁵Ben Smith, "Australia's Minerals Production and Trade: Case Study of a Resource-Rich Developed Country," in these Proceedings.

⁵⁶Peter Drysdale, "Pacific Economic Integration: An Australian View," loc. cit.; and "Australia, Japan, New Zealand: The Prospect for Western Pacific Economic Integration," loc. cit.

⁵⁷For a full review of these issues see J.G. Crawford, Saburo Okita, et.al., op. cit., Chapter 5; Kiyoshi Kojima, "Japan's Resource Security and Foreign Investment in the Pacific," op. cit., p. 24.

⁵⁸G.W.P. George, loc. cit., pp. 41 ff. Major and recurring differences have also arisen over balance of payments management and, alongside the energy issue that problem will persist.

⁵⁹Hugh Patrick, "United States Foreign Economic Policy towards Japan and the Pacific," Australia-Japan Economic Relations Project Paper, Australian National University, Canberra, November 1975.

⁶⁰President Carter Announces Discussions on Nuclear Power Policy, Statement of President Carter, Department of State Bulletin, May 2, 1977, pp. 429-33.

⁶¹Ambassador Yoshio Okawara, Address to National Press Club, Canberra, 4 August 1977; Australian Financial Review, 1 June 1977.

⁶²Prime Minister Malcolm Fraser, in Commonwealth of Australia, Australian Parliamentary Debates, House of Representatives, 24 May 1977, pp. 1701 ff.

⁶³A Royal Commission under the Chairmanship of Mr. Justice Fox was set up to enquire into the environmental implications of uranium mining in Australia. See Ranger Uranium Environmental Inquiry Report, Vol. I and II, Australian Government Printing Service, 1976 and 1977.

⁶⁴The Opposition Labor Party, at its Conference in Perth on 7 July 1977, called for an indefinite moratorium on mining and has pledged not to guarantee honoring any contracts for export entered in the interim, automatically reviewed in 1979.

⁶⁵J.D. Anthony, Canberra Times, 25 March 1977; M.J. Fraser. Australian Financial Review, 19 July 1977.

⁶⁶See J. G. Crawford and Saburo Okita, op. cit., Chapters 8 and 9.

AN ORGANIZATION FOR PACIFIC TRADE, AID AND DEVELOPMENT:
REGIONAL ARRANGEMENTS AND THE RESOURCE TRADE
A COMMENT

Saburo Okita

As I am closely associated with the work of Professor K. Kojima and Professor P. Drysdale the OPTAD ideas are very close to my heart. At the Seventh Pacific Trade and Development Conference held in Auckland, New Zealand, I personally questioned a delegate from Fiji as to the reason why they joined the Lome Convention. The answer was simply that there was no such arrangement in the Pacific area. There is a kind of vacuum that exists in this part of the world.

Turning to the Japanese point of view about OPTAD, recent developments in the world affairs will have to be taken into consideration. First, the holding of the summit conferences among the major industrialized countries has strengthened Japan's horizontal relations with North America and Europe and this has made the leaders become more aware of Japan's global involvement and responsibility. Second, the invitation from the ASEAN Heads of States' meeting held in Kuala Lumpur recently to leaders of the three Pacific developed countries, that is, Japan, Australia and New Zealand, may become a precedent for the new formula of their participation in the affairs of developing countries in the Pacific region. At least Japan would prefer a low posture to strong leadership coming from the Pacific Five developed countries.

The above two new developments may somewhat weaken Japanese interest in setting up a body of the OPTAD type although there are problems such as the position of non-ASEAN developing countries in the region. On the other hand, the energy problem is a very keen issue for Japan. With the prospect of a possible future shortage of oil, Japan will have to depend more on imported coal and uranium, the

supply of which is expected mostly from Australia, the United States and Canada. If a beginning is to be made in terms of energy problems, Japan may feel attracted to the idea of regional cooperation.

At any rate, there should first be an agreement among the governments of the Pacific Five to initiate a task force studying the overall feasibility and validity of OPTAD in parallel with the task forces on specific issues enumerated at the end of Drysdale's paper.

AN ORGANIZATION FOR PACIFIC TRADE, AID AND DEVELOPMENT:
REGIONAL ARRANGEMENTS AND THE RESOURCE TRADE
A COMMENT

Seiji Naya

Some years ago, at one of the Conference series, Professor Kojima in his bold proposal argued for the establishment of a Pacific Free Trade Area (in short PAFTA) with the twin objectives of providing a stimulus for trade among Pacific countries and at the same time assisting Asian developing countries more effectively. Many elements of Kojima's proposal on PAFTA are incorporated, discarded and refined and additional political-economic reality is added. In Peter Drysdale's imaginative think piece he calls for the establishment of a loose form of consultative organization, namely the Organization for Pacific Trade, Aid and Development. Drysdale brings together skillfully various economic and political forces in this region and elsewhere, particularly Europe. After my quick glance at it, I felt a fuller comprehension will require more time. And for other reasons, the three discussants decided to form a cartel and share this rich pie of the proposal.

My cartel share is to focus on a few implications his proposal has on developing Asian Pacific countries. At the outset, I must mention I am skipping questions of how effective, how costly and how possible it is to set up such an organization. Since it is a loose form of non-treaty binding organization it may not be very effective. But I do endorse his proposal. One is impressed with Drysdale's strong emphasis on developing countries; about half of his essay touches upon trade, investment and aid problems of these countries. As Drysdale states, one important aim is to provide a stimulus to aid investment flows for those countries and to provide a framework and structure of their aid, trade and investment relations

with Pacific DCs.

Among economic forces affecting these developing countries, the role of Japan and the U.S. are by far the most important although signs of increasing ties between other DCs and developing countries have become more visible. In recent years, Japan has replaced the U.S. as the most dominant country in trade and investment areas.

It is well known that Japanese economic cooperation has been largely commercially motivated, closely tied to its export expansion and imports of raw material. But considerable improvements have been made in recent years that have somewhat changed the image of Japan. In fact, Japan has emerged as the peacemaker of ASEAN cooperation by tying its \$1 billion aid package for the five Asian industrial projects. To what extent DCs in the Pacific can pull together their resources in aiding ASEAN projects is difficult to say. But I do worry about a political reaction against Japan as she increases her dominant position.

There is one area in which the OPTAD can be extremely useful. This relates to national rules and regulations covering foreign investment. They vary widely among countries and there is a tendency for Asian countries to compete in attracting foreign investment. The OPTAD can give a framework in which differences in these regulations can be discussed and possibly harmonized.

Another useful area of the OPTAD type of consultation is trade liberalization. Like other developing countries, developing Pacific Asian countries have not been full participants in the process of tariff reduction and trade liberalization that has taken place under the GATT. Although tariff cuts exchanged by DCs were extended to them, these cuts relate largely to those traded by DCs. The result is that tariffs of developing Asian countries remain very high and are often highly distorted. It is extremely difficult to dismantle and rationalize their tariff structure -- this is true for such expansion-oriented countries as Korea as Wontack Hong presented and is even more true for other countries. The difference in the tariff level has been one of the stumbling blocks against the progress of intra-ASEAN trade liberalization. For example, the difference in

tariffs between Indonesia and Singapore is enormous. OPTAD may be useful if such tariff harmonization is directly connected with the opening up of DC's market for their poor neighbors.

Wontack expressed his worry about rising sentiments of import protection in the Pacific DCs -- a lot has been said on this in various studies and at previous conferences.

Time does not allow me to touch on others. But there is one area Drysdale omits totally. This is a possibility of useful joint research through the framework of OPTAD. It might well be useful to set up task forces or other mechanisms under OPTAD to encourage joint policy-oriented research on topics related to trade, aid, and development in the region, especially in light of the needs of its developing countries.

AN ORGANIZATION FOR PACIFIC TRADE, AID AND DEVELOPMENT:
REGIONAL ARRANGEMENTS AND THE RESOURCE TRADE
A COMMENT

Hugh Patrick

This is both a very useful and a very stimulating paper. It provides an excellent overview of the evolving considerations of institutional development at the government level to enhance information flows, negotiation, and cooperation among the nations of the Pacific, and outlines the role of an OPTAD and a Pacific Resources Bank as desirable regional institutional innovations. The paper is stimulating in bringing to the fore consideration not only of institutions but also of at least two areas which have not been adequately treated at this Conference: the developed country governmental concessional financing and the private international capital market financing of mineral resource projects; and the potential role of uranium, in various forms, in the long-run solution of energy needs of the region (and indeed the world).

As is his wont, Drysdale has, near the end of this Conference, raised new, important issues, thereby underlining the ongoing need for future Pacific Trade and Development Conferences. And because these and other issues of trade, aid and investment will become increasingly important in the Pacific region context, it is not simply make-work, or a justification for continuation of the Conference series simply because the momentum exists. As anyone who has organized one of these Conferences well knows, the extreme simplicity of our institutional structure, its bare bones quality (the budget for the International Steering Committee is zero), and the specific funding needs for each conference in turn, attest to the

commitment of all at this Conference to seek rational policy options and good solutions to the economic issues confounding our countries in their relationships with each other.

Why should the United States be willing to participate in an OPTAD or similar regional institutional approach, rather than continuing to rely on a global approach to economic issues on the one hand, and on direct bilateral relationships on the other hand? Isn't OPTAD, or something similar, a second-best solution for which there are other, better, second-best solutions? Surely these must be among the questions U.S. policymakers must be asking themselves.

I see both positive and defensive reasons for an American involvement in a Pacific regional organization along the lines Drysdale and others have suggested. On the positive side, first the United States must become increasingly aware of the economic importance to it of the Pacific region, and willing to face the economic issues that come up in a Pacific context. Incidentally, absolute increases in the burgeoning economic relationship are probably more important than the changing relative shares in American global trade, aid and investment. Second, the future major issues for American policy in the Asian-Pacific region will derive from economic bases rather than geo-political and military security problems. Third, there may be advantages in starting small by using a regional approach to some global issues; moreover, the sorts of relatively simple, informal, consultative channels proposed by Drysdale appear effective ways to obtain information and present views, as well as seeking solutions to specific regional problems. Fourth, even within the context of global problems, the approaches and interests of the Asian developing nations are different from those of Latin America or Africa -- as has so clearly come out in this as in earlier Conferences, and Japan and Australia are different from the nations of Europe. Fifth, there are definite advantages in moving from the bilateral to the multilateral context in dealing with other important nations on many issues. For example, it is probably beneficial to place the multilateral component of the United States-Japan relationship also in a regional Pacific context rather than that of

the United States-Japan relationship also in a regional Pacific context rather than that of the OECD in order not to isolate Japan, and to provide Japan the greater weight and importance it has earned.

There are more defensive reasons for the United States not to stay out of any regional organization that may develop. It always can be viewed as a potential counterforce should the European Community become increasingly inward-looking. Moreover, should others join together -- say Australia, Japan and the ASEAN nations -- it is important for the United States (and other nations as well, as Wontack Hong noted for South Korea) to know what is going on, to be in on the action, and to try to shape developments in light of one's own national interests.

The nature of the membership in OPTAD will certainly affect its results. If it comprises only the Pacific Five -- to use Drysdale's phrase -- or indeed only the core three of Australia, Japan and the United States, it could usefully meet their needs as economically developed nations to formulate common positions vis-a-vis the rest of the industrial world and also the developing Asian-Pacific countries. However, as Seiji Naya has implied in his comments, it would be very unfortunate, perhaps disastrous, for the American, Australian, and Japanese relationships with the developing Pacific nations, encouraging confrontation and conflict rather than cooperation and compromise. It is essential that the developing nations of the Asia-Pacific have an integral role in OPTAD.

It is interesting that Drysdale never mentions the Asian Development Bank, much less suggests that it take on the functions envisaged for OPTAD. There are probably several very good reasons why the ADB is not the proper vehicle. As a development bank, it has its own particular mandate and banker's point of view. As a UN organization, it may not be an appropriate locus for regional consultation among national governments. And it has its own internal institutional problems. (Similar comments apply even more to ESCAP.)

Drysdale's discussion of the financing of natural resource projects is particularly interesting. This topic has arisen from time to time in our discussions but only tangentially. The capital

requirements for most minerals projects are immense, and apparently of a nature that financing can combine large reliance on long-term international debt as well as equity. Accordingly, the degree to which private and public international capital markets are segmented, and how efficient those capital markets are, becomes of great practical importance.

Drysdale first treats concessional aid funding of resource projects in LDCs mainly in terms of bilateral programs of the economically-advanced countries. He does not consider the international lending agencies in any detail. He importantly stresses there are segmented aid markets, not only with national tying but also preference to natural resource projects, and these have serious distorting effects. Of course, a sophisticated and efficient LDC government could make such resource project aid tangible to other social uses by reallocating the additional rents derived from the project -- if such governments exist. Moreover, distortions induced by tied concessionary aid are likely also to distort the private capital market funding of specific projects, as Drysdale emphasizes.

I did not fully understand the discussion concerning the effect of concessional aid on increasing rents. If concessional aid simply reduces the private cost of projects that would be undertaken anyway, the rent is of course larger in the same amount. Will the host government be able to capture this rent in full? However, if concessional aid increases the number of projects beyond what would otherwise occur, then national and world supply increases more and global price and rents decrease.

Drysdale worries that the LDCs do not have adequate access to private capital markets on a commercial basis, for resource or indeed for other projects. We need further study on how efficient the international capital market really is. Certainly it is much more efficient than earlier, in part because it has been forced to intermediate the OPEC petrodollar surpluses, with recycling supplies greater than funds demand in the industrial nations. It appears the international capital market has behaved quite rationally and efficiently. It has taken considerable risk and lent large amounts to

developing countries, not necessarily to those with large natural resources (though that helps) but to those which demonstrate good economic management capability and lesser political risk -- such as South Korea or Mexico. Our problem is perhaps an excessive amount of risk absorption in LDC loans by American banks, and not enough by those in other advanced countries, especially Japan. I am sure American banks would be delighted to lend more Eurodollars to Japanese banks to relend to developing Pacific countries.

Yet the international capital market is not perfect. The sheer lumpiness of resource projects may require higher interest rates because of the amounts involved, even though the borrowers may be very large companies or governments. I would like to learn more on this matter from those here who have empirical experience. Moreover, the capital market may be segmented or biased. Are higher interest rates charged on resource projects than on electric power or manufacturing projects of the same size and life span? How important are specific developed country ties with certain LDCs -- through history, current alliances, or whatever -- in resulting in more favorable private capital market treatment (perhaps because of implicit government guarantees)? My guess is that ex-colonial relationships may not count for a great deal in private financial preferential arrangements among Pacific nations, though that again is an empirical question; does one think immediately of the UK and Malaysia or Singapore, the Philippines and the United States, or Papua New Guinea and Australia? Does it matter in which countries foreign banks operate, and under what conditions? These clearly are questions that must be addressed, in the future if not here.

Let me end on two minor comments. First, I disagree with Drysdale's suggestion that the oil crisis has been the most important problem in Japan-U.S. relations. From an American perspective, the Japanese trade and balance of payments surplus and U.S. deficit of 1971-2 was an even more severe problem, which I hope will not be equally severe in 1977 and 1978. Second, the uranium cartel somewhat dispels the belief that economically-advanced country governments will never engage in export embargoes, price-fixing, or cartelized

price increases. Let us hope such action will apply only to the military-strategic arena. But uranium too is a complex subject, worthy of further discussion on another occasion.

AN ORGANIZATION FOR PACIFIC TRADE, AID AND DEVELOPMENT:
REGIONAL ARRANGEMENTS AND THE RESOURCE TRADE
GENERAL DISCUSSION

The OPTAD proposal was welcomed by almost all participants, though some expressed partial reservations. Further suggestions were made on the usefulness of such an organization. Its objectives should be broader than just solution of resource trade problems, which are the major concerns of the larger nations, and include attention to the trade and investment problems peculiar to the smaller nations. It might also be devoted to development of alternative energy technologies. The goal of trade restructuring was probably unrealistic for a loose OECD-type organization, and a stronger organization, along the lines of a common market might be needed. The research goals could perhaps be equally well fulfilled by existing international, national, or private institutions. The newly proposed Pacific Resources Bank is a potentially useful means to handle riskier investments.

Patrick's remarks on capital market inefficiencies were discussed. One participant thought that distortions in private investment could partly be linked to public investment flows which took the form of bilateral concessionary aid. Others cited evidence which indicated that U.S. investors, unlike the Japanese, did not appear to take advantage of incentives in promoted investment areas.

The U.S. viewpoint on OPTAD was considered. It was acknowledged that improved economic relations in the Pacific, except with Japan, were not high on the U.S. government's priority list, but OPTAD seemed a good means to begin conversion of a U.S. geopolitical-military perspective to an economic perspective. There may be some conflict between global and regional goals. For example, Latin America, Africa, and even Europe, might view U.S. participation in OPTAD as some form of attention lapse or even discrimination. On the

other hand, global and regional interests were not necessarily conflicting. The implications of OPTAD for U.S. industry were also wondered about.

Patrick's exclusion of New Zealand and Canada from the "Pacific Three" did not go unnoticed. The New Zealand viewpoint was that some 24 small nations are members of the regional community, and have legitimate claims to membership in OPTAD. The Canadian viewpoint was that the U.S. expressed no more interest in the region than did Canada. Canada actually has two advantages in membership over the U.S.: first, the Canadian economy is smaller and hence more flexible, and second, any dilution of the Canadian-American relationship is a strong political incentive. Another participant remarked that the potential of general Asian-Pacific development is great, and a narrow focus on Japanese relations is short-sighted of either the U.S. or Canada.

Table A-1
 MINE PRODUCTION OF COFFEE (COFFEE CONTENT), SELECTED YEARS, 1955-1975
 (thousand tons)

	1955	1960	1965	1970	1973	1974	1975	1955 1965	1965 1975	1955 1975
WORLD	3109.5	4239.2	5059.6	6386.4	7511.2	7654.5	7301.4	5.0	3.7	4.3
DEVELOPING COUNTRIES										
CHILE	1282.1	1885.2	2102.4	2445.4	2979.9	3179.9	3017.3	5.0	3.7	4.3
INDONESIA	433.5	532.1	585.3	691.6	735.4	902.1	826.3	3.0	3.0	3.0
PAPUA NEW GUINEA					37.9	65.4	65.4	0.0	0.0	0.0
PERU	43.4	184.0	180.3	220.2	182.9	184.1	172.5	0.0	0.0	0.0
PHILIPPINES	17.5	44.2	62.7	160.3	221.2	213.2	173.8	14.0	0.4	7.0
YUGOSLAVIA	29.1	33.3	62.6	90.8	111.8	112.1	109.5	12.0	13.0	13.0
ZAIRE	235.1	302.3	288.6	387.1	488.6	494.6	494.8	2.0	5.0	4.0
ZAMBIA	358.4	576.5	695.7	684.1	704.6	698.0	676.9	6.0	0.0	3.0
ZIMBABWE	164.9	212.9	277.2	211.3	275.5	284.9	272.2	3.3	1.8	2.5
DEVELOPED MARKET ECONOMY COUNTRIES										
AUSTRALIA	1447.7	1729.4	2051.6	2722.6	3040.8	2959.5	2660.3	3.5	2.7	3.1
CANADA	48.1	111.2	91.8	157.8	220.3	251.3	218.6	6.0	8.0	7.0
USA	295.7	398.5	460.7	610.3	827.9	821.4	712.9	4.0	4.0	4.0
OTHERS	905.9	979.9	1226.3	11560.0	1558.5	1448.8	1280.0	3.0	0.0	2.0
	198.0	239.0	262.8	354.5	458.1	438.0	448.6	2.9	5.5	4.2
SOCIALIST COUNTRIES										
OF EASTERN EUROPE										
POLAND	370.6	552.6	828.6	1098.4	1330.5	1365.1	1463.8	8.5	5.9	7.2
USSR	5.5	10.7	15.1	82.9	152.0	185.0	230.0	10.0	28.0	19.0
OTHERS	335.0	500.0	750.0	925.0	1060.0	1100.0	1100.0	8.0	4.0	6.0
	30.1	41.9	63.5	90.5	110.5	120.1	133.0	27.8	7.8	7.8
CHINA	9.0	72.0	87.0	120.0	140.0	150.0	160.0	23.0	6.0	15.0

Sources: UNCTAD TD/B/IPC/COFFEE/AC/1.5, 28 January 1977.

Table A-2

WORLD IMPORTS BY AREA OF ORIGIN - COPPER ORES AND CONCENTRATES
(COPPER CONTENT), 1965
(thousand tons)

Importing area	WORLD	DEVELOPING COUNTRIES	DME TOTAL	USA	JAPAN	EEC II OTHERS	SOCIALIST COUNTRIES	CHINA
Area of origin								
<u>WORLD</u>	232.3	1.7	226.3	33.5	140.0	31.1	21.7	4.1
<u>DEVELOPING COUNTRIES</u>								
CHILE	148.0	1.7	146.5	25.4	81.5	27.7	9.8	0.2
PERU	14.5	-	14.5	2.9	2.6	8.0	1.0	-
PHILIPPINES	20.1	-	20.1	9.4	8.2	-	2.5	-
ZAMBIA	70.2	-	70.2	11.2	59.0	-	-	-
ZAIRE	-	-	-	-	-	-	-	-
TANZANIA	0.2	-	0.2	-	0.2	-	-	-
OTHERS	43.0	1.7	39.4	1.9	11.5	19.7	6.3	0.2
<u>DEVELOPED MARKET ECONOMY COUNTRIES</u>								
AUSTRALIA	82.7	-	80.3	9.1	57.1	3.2	11.9	-
CANADA	11.3	-	11.3	0.8	10.5	-	-	-
EEC II	51.2	-	51.2	5.8	38.9	1.5	5.0	-
USA	4.1	-	4.1	-	-	0.1	1.9	-
OTHERS	6.8	-	6.5	-	5.3	0.2	1.0	-
	9.3	-	9.3	1.5	2.4	1.4	4.0	-
<u>SOCIALIST COUNTRIES OF EASTERN EUROPE</u>								
	1.6	-	1.6	-	1.6	0.2	-	-
CHINA	-	-	-	-	-	-	-	-

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Source: UNCTAD TD/B/TIC/COPPER/JAC/L.5, 28 January 1977.

Table A-3
WORLD IMPORTS BY AREA OF ORIGIN - COFFEE BEANS AND CONCENTRATES
(COFFEE CONTENT), 1975
(thousand tons)

Area of origin	Importing area			DME TOTAL	USA	JAPAN	EEC (11 OTHERS)	SOCIALIST COUNTRIES	CHINA
	WORLD	DEVELOPING COUNTRIES	DEVELOPING COUNTRIES						
WORLD	1041.0	12.9	1012.9	68.6	729.5	152.8	62.0	15.0	0.2
DEVELOPING COUNTRIES	640.4	6.7	621.5	28.4	460.8	109.9	22.4	12.0	0.2
CHILE	104.0	3.6	88.4	0.5	70.1	16.7	1.1	12.0	-
INDONESIA	74.2	-	74.2	-	61.2	13.0	-	-	-
PAPUA NEW GUINEA	154.6	-	154.6	-	86.8	67.8	-	-	-
PEPU	14.5	-	14.5	6.5	6.6	1.4	-	-	-
PHILIPPINES	215.6	3.0	212.6	11.4	200.3	0.9	-	-	-
ZAIRE	21.3	-	21.3	-	25.2	2.1	-	-	-
OTHERS	50.2	0.1	49.9	10.0	10.6	8.0	21.3	-	-
DEVELOPED MARKET ECONOMY COUNTRIES	400.2	6.2	393.5	40.2	268.7	42.9	39.2	3.0	-
AUSTRALIA	53.2	1.3	51.9	1.6	36.7	0.9	12.4	-	-
CANADA	279.3	2.2	277.1	35.4	225.8	11.0	2.7	2.0	-
EEC (11)	17.4	2.5	14.9	-	-	1.0	13.4	0.5	-
USA	6.6	0.2	6.4	-	6.2	0.1	0.1	-	-
OTHERS	43.7	-	43.4	2.9	-	29.9	10.6	0.3	-
SOCIALIST COUNTRIES OF EASTERN EUROPE	0.4	-	0.4	-	-	-	0.4	-	-
CHINA	-	-	-	-	-	-	-	-	-

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SOURCE: UNITED TOBACCO/COFFEE/MC/L.5, 28 January 1977.

Table A-4
MAJOR WESTERN CANADA COPPER PRODUCERS 1975

Company	Mill Capacity (tonnes/day)	Copper Output (tonnes)	Destination	(per cent)
BRITISH COLUMBIA				
Bethlehem Copper Corporation Ltd. Mountie Mine	18,100	24,780	Japan	100
Branda Mines Ltd. Reaschland	21,800	15,100	U.S.A. Canada Japan	36 34 30
Craigmont Mines Limited Herritz	4,800	24,730	Canada Japan U.S.A.	42 33 25
Gibraltar Mines Ltd. (N.P.L.) McLeese Lake	36,300	37,900	Japan	100
Granby Mining Corporation Granisle Mine	11,800	17,410	Japan Germany	65 35
Phoenix Copper Division	2,300	4,200	U.S.A.	100
Grandus Operating Company Grandus Mine	6,800	16,935	Japan Germany	95 5
Lornex Mining Corporation Ltd. Lornex Mine	34,500	48,600	Japan U.S.A.	77 23
Noranda Mines Limited Bell Copper Division	11,800	16,470	Canada	100
Similkameen Mining Company Limited Ingerbelle Pit	13,600	14,760	U.S.A. Japan	60 40
Texada Mines Ltd. Vananda	3,600	1,600	Japan	100
Utah Mines Ltd. Island Copper Mine	34,500	50,240	Japan	100
Western Mines Limited. Lynn & Myra Falls Mines	1,000	2,710	Japan	100
Westfrob Mines Limited Tasu Mine	5,300	1,540	Japan	100
YUKON				
Whitehorse Copper Mines Ltd. Little Chief Mine	2,200	9,100	Canada	100
Selected other Canadian Companies that ship to Japan				
Sherritt Gordon Mines Ltd. - Fox mine	2,580	14,280	Canada Japan	92 8

Minecals and Metals Division, DMC.
January 1977

Table A-5

PRODUCTION OF REFINED COPPER, SELECTED YEARS 1955-1975

(thousand tons)

	1955	1960	1965	1970	1972	1973	1974	1975	1975 1975	1975 1975	1975 1975
WORLD.....	3,838	4,910	6,058	7,578	8,686	8,524	8,820	8,363	5.0	3.1	4.0
DEVELOPING COUNTRIES.....	645	853	1,145	1,494	1,823	1,638	1,865	1,784	5.9	5.3	5.2
CHILE.....	243	289	485	488	483	415	530	535	1.9	8.4	4.1
MEXICO.....	351	280	441	541	600	571	701	701	2.0	4.1	3.5
PERU.....	281	301	411	311	391	311	371	531	3.9	2.6	3.2
YUGOSLAVIA.....	281	341	541	891	131	131	151	131	7.2	9.4	8.3
ZAMBIA.....	101	201	1521	2081	2161	2321	2551	2261	2.9	4.1	3.5
ZAFRICA.....	101	401	521	581	631	631	671	621	1.2	1.9	6.5
OTHERS.....	191	271	391	751	1001	1081	1301	1331	7.4	13.1	10.2
DEVELOPED COUNTRIES.....	3,193	4,057	4,913	6,089	6,863	6,886	6,955	6,579	1.9	1.5	2.6
UNITED STATES.....	1,122	1,182	1,242	1,282	1,342	1,382	1,422	1,462	2.6	0.5	1.6
FRANCE.....	157	200	300	338	314	348	379	346	6.7	1.3	4.0
GERMANY F.R.....	273	319	342	406	399	407	424	422	3.9	-0.1	1.8
UK.....	231	213	220	226	178	171	161	152	-0.1	-3.9	2.3
AUSTRALIA.....	391	841	931	146	174	171	195	193	9.1	7.6	8.3
CANADA.....	262	318	394	403	446	468	559	529	4.2	3.0	3.6
JAPAN.....	113	243	344	305	310	351	396	389	12.3	8.4	10.4
OTHERS.....	114	154	181	242	309	309	361	358	4.8	7.1	5.9
SOCIALIST COUNTRIES OF EASTERN EUROPE.....	584	765	904	1,124	1,232	1,244	1,272	1,252	5.9	7.4	6.7
BULGARIA.....	41	141	241	381	451	481	471	521	15.6	8.7	13.7
CZECHOSLOVAKIA.....	421	641	401	501	471	451	431	431	0.3	0.3	0.1
POLAND.....	881	221	371	131	131	131	151	249	7.3	21.9	14.0
USSR.....	432	672	770	1,075	1,225	1,300	1,350	1,420	6.3	6.1	6.2
OTHERS.....	111	181	301	491	641	741	831	891	11.5	10.1	11.0
OTHER.....	101	161	1101	132	100	200	250	250	27.1	8.1	17.5

Source: UNCTAD TD/B/CPC/COPPER/AC/L.5, 28 January 1977.

Table A-6. Consumption and Sources of Supply of Copper in Selected Developed Countries, 1965 and 1975
(thousand tons)

	Consumption	Production		Total Net Imports + Exports -	Net Imports as % of Consumption
	Refined	Mine	Secondary Refined		
1965					
EEC of the Nine	1,823.6	3.1	375.6	+ 1,411.9	77.4
Australia	101.5	91.8	34.4	-9.0	..
Canada	209.0	460.7	10.0	-252.9	..
Japan	427.5	107.1	65.5	+249.5	58.4
United States	1,844.3	1,226.3	389.2	-141.2	7.7
1975					
EEC of the Nine	1,954.0	13.1	337.6	+ 1,809.4	92.6
Japan	821.8	84.6	76.9	+912.6	111.1
United States	1,396.3	1,280.0	299.9	+111.6	8.0
Australia	124.9	218.8	25.0	-146.2	..
Canada	196.1	712.9	28.0	-623.5	..

Source: Derived from data prepared by UNCTAD Secretariat TD/B/IPC/COPPER/AC/L.5, January 1977.

Note: Inventories are omitted.

Table A-7. Lead Mine Production in the Pacific Rim
(1000 tons of contained lead)

	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1974</u>	<u>1975</u>
United States	226.5	273.2	524.9	615.8	575.4
Canada	186.6	264.7	351.0	301.4	352.5
Mexico	190.7	169.7	176.6	218.0	179.4
Peru	131.2	154.3	155.0	185.6	166.3
Japan	46.3	54.9	64.3	44.2	50.6
Korea	n.c.	4.3	16.1	8.0	9.9
Thailand	n.a.	7.4	1.9	3.6	3.6
Australia	313.1	367.9	449.9	375.3	408.6
Philippines	-	0.1	-	1.3	3.4

Sources: World Metal Statistics.
Metallgesellschaft

Table A-8. Refined Lead Production in the Pacific Rim
(1000 tons)

	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1974</u>	<u>1975</u>
United States	481.2	533.2	729.5	751.5	751.5
Canada	143.8	169.2	185.6	126.4	171.5
Mexico	166.7	172.4	180.3	201.9	175.4
Peru	74.1	86.8	72.2	80.6	71.0
Japan	74.2	108.6	208.6	227.9	194.2
Australia*	192.9	196.4	180.1	224.8	189.8
Korea	-	-	3.0	4.6	5.7

Sources: World Metal Statistics
Metallgesellschaft

* Primary lead only.

Table A-9. Zinc Mine Production in the Pacific Rim (1000 tons of Contained Zinc)

	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1974</u>	<u>1975</u>
United States	395.0	554.4	496.0	498.3	470.1
Canada	369.1	745.7	1,139.1	1,206.9	1,194.5
Mexico	271.4	224.9	266.4	262.7	220.8
Peru	157.3	254.5	316.5	397.2	383.2
Japan	157.0	221.0	280.0	240.8	254.4
Australia	322.5	354.8	484.2	457.1	502.6
Burma	-	7.8	3.8	4.0	2.2
Korea	-	-	23.9	42.3	45.7
Philippines	-	2.0	3.2	7.8	10.5

Sources: World Metal Statistics.
Metallgesellschaft

Table A-10. Slab Zinc Production in the Pacific Rim (1000 tons)

	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1974</u>	<u>1975</u>
United States*	787.1	978.0	871.9	574.9	449.9
Canada**	236.7	325.2	417.9	426.3	426.9
Mexico	52.9	62.7	84.6	133.4	149.0
Peru	32.4	61.3	68.7	70.7	63.7
Japan	181.0	376.0	676.0	850.8	698.4
Australia	119.4	198.7	257.5	283.8	201.3
Korea	-	-	8.0	11.5	20.9

Sources: World Metal Statistics.
Metallgesellschaft.

* including distilled secondary zinc.

** primary metal only.

Table A-11. Slab Zinc Exports of the Pacific Rim Countries
(1000 tons)

	<u>1965</u>	<u>1970</u>	<u>1974</u>	<u>1975</u>
Japan	55.2	52.6	115.9	52.8
Canada	239.7	318.8	295.4	247.2
Mexico	25.9	35.9	73.6	86.3
Peru	56.5	65.3	65.9	57.8
U.S.A.	5.4	0.9	17.5	8.1
Australia	88.4	145.0	161.6	117.7

Source: World Metal Statistics.

Table A-12. Japan's Imports and Exports of Slab Zinc (1000 tons)

	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1974</u>	<u>1975</u>
<u>Imports</u>	26.1	7.0	21.9	23.8	22.2
of which from					
U.S.	9.9	-	-		
Canada	6.1	0.25	7.9	0.1	-
Australia	3.1	2.2	4.7	0.4	0.3
North Korea	-	1.5	6.7	11.5	18.0
Netherlands	3.5	0.2	-		
<u>Exports</u>	5.9	55.2	52.6	115.9	52.8
of which to					
India	5.9	7.7	0.2	5.4	2.2
Taiwan	-	3.7	5.4	3.4	6.1
Indonesia	-	-	1.8	3.4	4.6
Philippines	-	3.8	4.3	2.0	5.5
Thailand	-	.3	1.0	3.6	5.2
U.S.A.	-	13.9	27.2	50.7	1.7
South Korea	-	4.8	6.4	12.9	2.9

Source: World Metal Statistics.

Table A-13. Destination of Canadian Zinc Exports in Recent Years (1000 tons)

	<u>1970</u>	<u>1972</u>	<u>1975</u>
Ores and concentrates, total	809.2	695.1	718.1
(zinc content),			
of which Belgium	171.3	172.9	229.7
Germany	31.8	107.8	100.8
Japan	135.4	136.3	180.2
U.S.A.	307.4	137.8	86.1
Slab zinc, total	318.8	370.4	247.2
of which India	26.2	10.9	1.2
U.K.	86.3	78.3	56.4
U.S.A.	110.1	247.6	161.6

Source: Statistics Canada.

Table A-14. Lead Exports by Pacific Rim Countries (1000 tons)

	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1975</u>
<u>Australia</u>				
Refined lead	127.3	159.1	158.9	117.2
Concentrates (lead content)	75.9	110.0	82.8	44.6
Lead Bullion	50.5	70.4	165.6	142.4
<u>Peru</u>				
Refined lead	59.7	85.4	65.8	62.7
Concentrates (lead content)	57.9	61.4	90.5	n.a.
<u>Mexico</u>				
Refined lead	131.6	96.7	77.6	108.7*
<u>Canada</u>				
Refined lead	87.5	117.1	138.6	109.9
Concentrates (lead content)	46.6	96.9	150.5	211.9
<u>Japan</u>				
Refined lead	0.06	8.5	5.6	39.5
<u>United States</u>				
Refined lead	1.8	7.7	4.8	16.0

Sources: World Metal Statistics
Metallgesellschaft

* 1974 figure.

Table A-15. Destination of Canadian and Australian Lead Exports in Recent Years

	<u>1970</u>	<u>1972</u>	<u>1975</u>
<u>CANADA</u>			
Ores & concentrates, (lead content) total	150.5	162.0	211.9
of which Belgium	18.6	8.9	8.6
Germany	20.3	18.9	23.9
Japan	69.9	98.2	120.8
U.S.A.	37.2	23.7	38.4
Refined lead, total	138.6	127.8	109.9
of which to India	17.2	3.2	2.1
U.K.	50.9	44.7	44.3
U.S.A.	51.7	68.4	23.2
<u>AUSTRALIA</u>			
Ores & concentrates, total (lead content)	82.8	39.4	44.6
of which to			
Japan	16.7	6.4	6.2
U.K.	11.5	-	-
U.S.A.	29.2	19.3	12.1
Lead bullion, total	165.6	145.0	142.4
of which to			
U.K.	143.1	116.5	119.5
Netherlands	16.4	15.3	11.6
Refined lead, total	158.9	139.5	122.0
of which to			
India	16.3	22.2	19.2
New Zealand	5.7	7.2	7.5
U.K.	57.9	40.4	44.6
U.S.A.	59.3	45.9	-

Source: World Metal Statistics.

Table A-16. Australian Production of Bauxite, Alumina and Primary Aluminum in Selected Years

	(1000 tons)				
	<u>1965</u>	<u>1968</u>	<u>1970</u>	<u>1974</u>	<u>1975*</u>
Bauxite	1,185.7	4,960.1	9,255.7	19,995	20,800
total contained alumina	622.8	2,677.1	4,972.3	10,490	11,150
Alumina production	202.2	1,308.6	2,151.9	4,900	5,000
Primary aluminum	89.4	98.	204	219	213

* 1975 figures partially estimated

Sources: Australian Mineral Industry (various annual editions),
Bureau of Mineral Resources, Dept. of National Development,
Canberra.

Table A-17. Bauxite Production in the Pacific Rim in Selected Years

	(1000 tons)			
	1960	1965	1970	1974
Australia	70.5	1,186	9,255	19,995
Indonesia	395.7	688	1,229	1,290
Malaysia	459.2	857	1,139	947
United States	2,030.	1,680	2,115	1,997
World Total	27,620	37,291	59,484	77,795

Sources: World Metal Statistics,
Metallgesellschaft

Note: Not adjusted for variations in aluminum content.

Table A-18. Japan's Aluminum Production, Imports and Apparent Consumption

	(1000 tons)			
	<u>1965</u>	<u>1970</u>	<u>1974</u>	<u>1975</u>
Primary aluminum production	293.8	732.7	1,123.4	1,015.8
Imports of Ingots	42.3	258.2	478.6	378.2
Recovery of secondary aluminum	113.2	239.7	229.3	205.2
Exports of ingots	28.2	5.5	34.8	83.5
Exports of mill products	24.8	40.8	33.0	51.3
Apparent consumption*	397.3	1,187.3	1,806.7	1,486.4

* Without adjustment for inventory changes

Source: Japan Light Metal Association (original figures converted to metric tons)

Table A-19. Per Capita Aluminum Consumption in Selected Countries (pounds)

	1965	1970	1973	1975
Australia	16.3	24.0	29.1	25.7
Brazil	1.3	2.4	4.0	4.9
Canada	21.4	25.8	33.1	27.5
Indonesia	0.1	0.4	1.9	2.9
Japan	8.7	24.8	37.7	26.9
Philippines	0.3	0.5	0.8	0.4
United States	41.1	44.9	65.1	44.3
West Germany	20.0	30.1	38.8	32.2
United Kingdom	20.2	24.4	27.5	21.7

Sources: Aluminum Statistical Review, 1975
The Aluminum Association, Inc., New York

Table A-20. Primary Aluminum Production in the Pacific Rim in Selected Years

	(1000 tons)			
	1965	1970	1974	1975
United States	2,498.8	3,607.1	4,448	3,519
Canada	762.3	972.2	1,006.5	880
Mexico	19.2	33.7	41.1	39.9
India	63.7	161.1	128.8	167.1
South Korea	-	16.8	17.7	17.6
Japan	294.0	732.8	1,118.4	1,013.3
Taiwan	18.9	27.0	31.3	28.1
Australia	87.8	204.5	219.1	214.2
New Zealand	-	-	110.3	108.6
World Total	6,610	10,325	13,809.5	12,693.6

Table A-21. Primary Aluminum Capacity Utilization in Japan, 1973-74*

	FY 1973 Actual	FY 1974 Actual	FY 1975 Actual	FY 1976 Prelim.	FY 1977 Estimated
Productive capacity	1,254	1,338	1,446	1,510	1,550
Production	1,082	1,116	988	970	1,240
Operating rate (%)	86.2	83.4	68.3	64.2	80

Source: Mill figures, Japan Metal Journal, May 2, 1977.

*Note: Fiscal years April 1 to March 31.

Table A-22. Present and Projected Supply and Demand for Primary Aluminum in Brazil*

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Aluminum										
Demand	235.0	282.0	338.0	405.0	490.0	584.0	700.0	841.0	1,009.0	1,211.0
Exports	-	-	-	-	-	54.0	19.0	25.0	75.0	163.0
Supply	137.0	152.0	184.0	228.0	490.0	538.0	719.0	866.0	1,084.0	1,374.0
Balance	-98.0	-130.0	-153.0	-177.0	-	-	-	-	-	-

Source: Brazilian Bulletin, Gov't of Brazil, September 1976.

*Based on current and proposed industrial development projects.

Table A-23. Mine Production of Nickel in the Pacific Rim

	(nickel content, 1000 tons)				
	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1974</u>	<u>1975</u>
Canada	194.6	235.1	279.5	269.1	242.7
United States	11.4	12.3	14.1	12.7	15.4
Indonesia	0.5	2.3	10.8	16.0	14.6
Australia	-	-	27.3	46.0	60.0
New Caledonia	53.5	61.2	138.5	136.8	133.3
Philippines	-	-	-	0.3	9.5

Sources: World Metal Statistics.
Metallgesellschaft.

Table A-24. Smelter Production of Nickel in the Pacific Rim*

(1000 tons)

	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1974</u>	<u>1975</u>
Canada	127.5	160.4	204.0	199.9	178.0
United States	12.2	12.6	14.3	12.7	19.9
Japan	18.7	26.1	89.9	104.6	78.0
New Caledonia	11.4	15.6	28.0	48.5	52.8
Australia	-	-	1.0	20.0	34.0
Philippines	-	-	-	-	8.2

Sources: World Metal Statistics.
Metallgesellschaft.

* Includes primary nickel and nickel in ferromnickel and nickel oxide sinter.

Table A-25. Canadian Nickel Exports in Selected Years

(1000 tons of contained nickel)

	<u>1965</u>	<u>1970</u>	<u>1974</u>
<u>Ores, concentrates & matte, total</u>	74.7	88.8	85.2
<u>of which to Norway</u>	29.7	43.1	42.4
U.K.	42.7	36.4	34.0
Japan	1.9	7.0	8.7
<u>Nickel in oxides, total</u>	37.2	39.8	51.1
<u>of which to U.S.A.</u>	24.6	24.8	32.8
EEC	4.3	4.6	9.0
U.K.	6.7	9.3	4.4
<u>Refined nickel, total</u>	122.6	138.9	118.8
<u>of which to U.S.A.</u>	100.0	93.8	75.3
U.K.	13.7	23.9	13.9
Japan	1.7	2.0	2.5
EEC	3.7	11.5	-
<u>Nickel and nickel alloys, fabricated materials, total</u>	2.9	3.3	8.8
<u>of which to U.S.A.</u>	2.1	1.6	6.5
EEC	0.9	0.5	0.3
Japan	0.02	0.18	-

Source: Statistics Canada.

Table A-26. Japan's Nickel Imports in Recent Years

(1000 tons)

	<u>1970</u>	<u>1974</u>	<u>1975</u>
<u>Ores & concentrates (gross wt)</u>			
of which from Australia	4,670	4,218	3,396
Indonesia	107	60	8.3
New Caledonia	524	792	872
	4,009	3,363	2,492
<u>Nickel matte and speiss</u>	18.3	39.8	27.4
<u>Ferronickel</u>	4.7	18.0	9.9
<u>Refined nickel</u>			
of which from Canada	6.3	16.3	8.4
Norway	1.0	3.6	2.5
U.S.S.R.	0.3	2.4	0.7
Other	3.9	4.8	2.2
	1.1	5.5	3.0
<u>Nickel alloy</u>	1.3	0.4	0.2

Source: World Metal Statistics.

Table A-27. Consumption of Nickel in the Pacific Rim*

	(1000 tons)				
	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1974</u>	<u>1975</u>
Canada	4.4	8.1	12.3	14.3	10.8
United States	98.1	156.1	145.0	189.1	132.9
Japan	17.6	26.9	98.7	119.1	90.0
Australia & Oceania	2.2	2.5	3.0	5.0	3.5

Sources: World Metal Statistics.
Metallgesellschaft.

* Including nickel content of ferronickel and nickel oxide sinter.

Table A-28. Production of Tin-in-Concentrates in the Pacific Rim

	(metric tons)				
	<u>1950</u>	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1975</u>
Indonesia	32,617	22,958	14,935	19,092	25,346
Malaysia	58,694	52,813	64,692	73,794	64,364
Thailand	10,530	12,275	19,353	21,779	16,406
Australia	1,884	2,237	3,911	8,876	9,310
World Total*)	164,800	138,700	154,400	185,700	175,700

*) Excluding production of Socialist countries.

Source: The International Tin Council

Table A-29. Consumption of Primary Tin

<u>Year</u>	<u>World</u> (a)	<u>USA</u>	<u>Japan</u>	<u>UK</u>	<u>Germany</u>	<u>France</u>	<u>Others</u>
				(metric tons)			
1965	173,000	59,489	17,425	19,564	11,849	10,298	54,600
1966	175,700	61,172	18,920	18,720	10,945	10,465	55,600
1967	174,600	58,774	20,729	17,633	10,837	10,871	55,900
1968	179,600	59,801	22,598	17,699	11,278	9,449	58,700
1969	186,600	58,654	25,879	18,059	13,429	11,278	58,900
1970	184,500	53,807	24,710	16,950	14,062	10,500	63,900
1971	189,000	52,814	29,300	16,425	14,202	10,450	66,600
1972	191,500	54,365	32,341	14,649	14,392	11,030	64,400
1973	213,600	59,075	38,676	16,600	15,847	11,701	72,000
1974	199,600	52,439	33,817	14,459	14,539	11,266	73,100
1975	174,300	43,620	28,115	12,165	11,958	9,968	68,400

Source: The International Tin Council.

(a) Excluding consumption in Socialist Countries.

Table A-30. Primary Tin Consumption by End Use, 1974-75 (metric tons)

		1974	1975
US			
Tinplate		23,051	18,869
Solder		11,558	10,669
Tinning		2,518	1,879
Bronze and brass		3,617	2,626
White metal		1,809	1,948
All other		9,886	7,629
Totals		<u>52,439</u>	<u>43,620</u>
Japan			
Tinplate		15,688	11,890
Solder		10,565	10,418
Tinning		695	578
Bronze and brass		1,411	1,290
White metal		1,404	1,085
All other		<u>4,054</u>	<u>2,854</u>
Totals		<u>33,817</u>	<u>28,115</u>
UK			
Tinplate		6,997	5,680
Solder		1,393	1,078
Tinning		1,139	1,197
Bronze and brass		1,903	1,715
White metal		2,323	2,274
All other		<u>2,975</u>	<u>2,486</u>
Totals		<u>16,730</u>	<u>14,430</u>

Source: The International Tin Council

Table A-31
Production of Tinplate
(metric tons)

		1972	1973	1974	1975
U.S.A.	{ E. H.	4,049,300	4,797,500	5,034,300	3,765,500
U.K.	{ E. H.	1,131,700 33,500	1,238,300 42,700	1,097,700 34,700	962,300 18,400
Japan	{ E. H.	1,732,000	1,907,000	2,016,000	1,560,000
France	{ E. H.	851,500 26,800	846,500 16,000	972,700 11,200	730,600 10,300
Germany	{ E. H.	713,400 26,800	749,700 31,500	875,600 36,000	724,600 27,000
Canada	{ E. H.	483,700	552,600	585,300	449,100
Netherlands	{ E. H.	413,900 29,800	436,000 27,000	460,200 18,800	386,400 -
Italy	{ E. H.	325,200 5,400	360,100 7,400	453,400 1,500	340,200 -
Australia	{ E. H.	234,700 15,300	305,400 -	340,900 -	266,100 -
Belgium	{ E. H.	295,300	287,700	354,900	286,200
Brazil	{ E. H.	237,200	238,600	254,200	277,500
Others		1,707,000	1,840,600	2,072,400	2,141,700
World		12,313,300	13,690,600	14,619,800	11,945,900

E = Electrolytic tinplate. H = Hot-dipped tinplate. (A) Included under "others"

* Excluding production in Socialist Countries.

Source: The International Tin Council.

Table A-32. Soviet Imports of Tin (metric tons)

	1965	1970	1974	1975
Total	5,800	9,016	6,535	9,888
of which from Indonesia	1,400	-	-	-
Bolivia (metal)	-	302	772	1,720
(in concentrates)	-	716	1,355	234
Malaysia	1,600	2,522	2,561	5,161
China	500	200	500	n.a.
U.K.	2,200	4,942	1,313	2,697

Note: Imports from all sources, except Bolivia, are of tin metal only.

Source: Soviet Foreign Trade, Moscow (annual yearbooks).

Table A-33, Production of Titanium Minerals in the Pacific Rim (1000 tons)

<u>Ilmenite</u>	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>
Australia*	108	448	890	709	816	1,013
Malaysia**	120	124	193	152	150	150
United States	713	879	787	729	695	637
<u>Titaniferous slag</u>						
Canada***	354	494	766	855	862	750
<u>Rutile</u>						
Australia	90	221	368	328	318	343

* TiO₂ content about 54%.

** Malaysian 1974 preliminary, 1975 estimated.

*** TiO₂ content 70-72%.

Sources: Statistics Canada, Commodity Data Summaries, U.S. Bureau of Mines, Australian Mineral Industry Review.

Table Z-34. Destination of Australian Rutile, Ilmenite and Zircon Exports in Recent Years (1000 tons)

	1970	1973	1974
Rutile Exports, total	374.2	339.2	344.4
of which to			
Canada	-	20.9	3.4
Japan	33.6	33.1	23.6
U.S.A.	195.8	131.9	157.2
U.K.	38.0	65.1	56.7
Netherlands	36.6	27.2	28.9
Germany	6.0	11.2	18.9
Ilmenite Exports, total	657.4	668.1	750.0
of which to			
Japan	227.4	111.8	133.9
United States	90.6	62.7	104.0
U.K.	207.8	239.3	198.8
France	100.1	160.0	141.6
Zircon Exports, total	379.8	431.3	388.5
of which to			
Japan	115.6	154.9	157.1
United States	83.7	88.5	47.6
U.K.	26.4	26.7	26.7
France	31.1	24.0	32.2
Netherlands	33.3	38.4	28.5

Source: Australian Mineral Industry Quarterly Review, (various editions).

Table A-35. U.S. Titanium Metal Production,* Imports and Consumption (short tons)

	Sponge Metal		Scrap Metal	Ingot	
	Imports	Consumption	Consumption	Production	Consumption
1963	1,468	8,865	2,335	11,138	10,506
1965	3,265	12,105	3,303	15,294	14,694
1967	8,125	20,062	5,822	25,960	25,386
1970	6,565	16,413	7,242	24,728	23,686
1972	3,795	13,068	7,802	20,267	19,499
1974	6,963	26,896	10,526	36,132	31,551
1975	4,190	17,671	8,316	25,378	24,486

* Sponge metal production figures are withheld by the U.S. Bureau of Mines to avoid disclosing individual company data.

Source: U.S. Bureau of Mines.

Table A-36. Zircon Production (1000 tons)

	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1974</u>
Australia	104.0	227.8	395.4	368.8
United States	50.9	54.3	58.2	110.5
Malaysia	3.0	3.0	1.7	4.0
Brazil	5.8	1.0	4.1	4.0

Sources: Australian Bureau of Mineral Resources, Geology and Geophysics.
U.S. Bureau of Mines.

Table A-37. Japan's Iron Ore Imports

	(millions tons)			
	1960	1965	1971	1974
Australia	-	0.21	46.3	67.88
U.S.A.	0.82	2.66	1.95	0.33
India	3.63	7.73	16.7	17.33
Brazil	0.36	0.92	8.99	19.52
Chile	0.25	6.93	9.04	8.57
Peru	0.63	4.53	7.42	5.96
Canada	1.08	1.95	2.70	4.51
South Africa	0.29	1.15	3.56	2.22
Philippines	1.20	1.48	2.30	1.64
Malaysia	5.35	6.96	0.90	0.08
Others	0.43	4.26	14.99	13.80
Total	14.86	38.77	114.84	141.82

Source: Japan Iron and Steel Federation.

Table A-38. Hard Coal Reserves and 1975 Production in the Pacific Rim

	(millions tons)			
	Estimated Reserves	Percent of World	Production	Percent of World
United States	2,500,000	28.0	568.0	25.9
Canada	80,000	0.9	21.7	0.9
Mexico	12,000	0.1	3.7	0.2
Chile	4,000	-	1.3	0.1
Peru	2,000	-	0.2	-
U.S.S.R.	4,500,000	50.5	536.0	22.1
China (P.R.C.)	1,000,000	11.2	470.0	19.7
Australia	100,000	1.1	66.5	2.8
Japan	7,000	0.1	19.0	0.8
New Zealand	700	-	2.3	0.1
Indonesia	2,000	-	0.2	-
South Korea	1,500	-	17.6	0.7
World total	8,912,000	100.	2,390.	100.

Sources: Commodity Data Summaries, U.S. Bureau of Mines,
Dept. of Energy, Mines and Resources.

Table A-39. Japan's Coking Coal Supply

	(millions tons)			
	1960	1965	1970	1974
Australia	0.88	6.04	14.95	20.7
U.S.A.	4.31	6.41	24.95	24.89
Canada	0.42	0.74	3.21	9.09
U.S.S.R.	0.44	1.02	2.57	2.82
Poland	-	-	0.9	1.15
Others	0.12	0.41	0.15	0.25
Total imports	6.17	14.62	46.77	58.90
Domestic supply	11.03	12.35	12.30	10.46

Source: Japan Iron and Steel Federation.

Table A-40. Japan's Pig Iron and Crude Steel Supply

(1000 tons)						
Pig Iron			Crude Steel			
Production	Imports	Total (a)	Production	Exports (b)	Exports % of Production	Domestic Supply (c)
1950	2,333	1	2,234	4,839	727	4,114
1955	5,217	19	5,152	9,408	2,305	7,185
1960	11,896	1,001	12,897	22,138	3,144	19,302
1965	27,502	2,631	30,127	41,161	12,705	28,488
1970	68,048	2,896	70,938	93,322	23,621	69,832
1973	90,007	1,563	91,454	119,322	33,430	86,147
1974	90,437	1,333	91,679	117,131	43,028	74,371

Source: Japan Iron and Steel Federation.

Notes: (a) Net figure after subtracting exports (generally nominal)

(b) Exports in crude steel equivalent.

(c) Including imports in crude steel equivalent (generally negligible).

Table A-41. Transition of World Steel Production by Process

	(% of total output by weight)			
	Open-hearth	Basic-Oxygen	Electric Furnace	Other*
1960	68.5	3.8	10.3	17.4
1965	59.0	16.4	12.0	12.6
1970	39.7	41.2	14.8	4.3
1974	22.2	57.8	17.9	2.1

Source: Dept. of Energy, Mines and Resources.

* Mainly Bessemer process.

Table A-42. Major Producers of Tungsten Ores in the Pacific Rim

	(metric tons)			
	1955	1965	1970	1974
Canada	1,278	1,344	1,341	1,590
United States	12,965	3,431	3,676	3,554
Bolivia	4,689	867	1,845	2,526
Brazil	1,114	182	1,160	950
Peru	705	379	827	682
Australia*	2,210	948	1,244	1,250
P.R.C.	15,664	7,985	7,987	8,000
U.S.S.R.	6,557	5,714	6,712	7,650
Japan	782	344	677	950
North Korea	1,623	1,905	2,141	2,200
South Korea	2,968	2,131	2,070	2,200
Malaysia	109	5	136	10
Thailand	1,080	264	711	2,600

Sources: Tungsten Statistics, U.S. Bureau of Mines Yearbooks.

* Including New Zealand.

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